DOCUMENT RESUME

ED 130 420 EA 008 804

TITLE	Using Construction Management for Public and Institutional Facilities.
INSTITUTION	Public Technology, Inc., Washington, D.C.
SPONS AGENCY	General Services Administration, Washington, D.C.
PUB DATE	Mar 76
GRANT	GS-00B-02104
NOTE	83p.; Table 5 may reproduce poorly due to small print size
AVAILABLE FROM	Public Technology, Inc., Building Technology Program, 1140 Connecticut Avenue, N.W., Washington, D.C. 20036 ($6.00)
EDRS PRICE	MF-$0.83 HC-$4.67 Plus Postage.
DESCRIPTORS	Building Innovation; *Community Agencies (Public); Construction Costs; *Construction Management; Construction Needs; *Construction Programs; *Cost Effectiveness; Facility Requirements; Occupational Information; *Professional Services; Records (Forms)

ABSTRACT

Construction management has been developed as an alternative to the traditional public building process and seeks to save an owner time and cost primarily through better activity coordination and project management. This report was developed to guide public agencies in their evaluation of construction management for their particular needs. It describes the several forms of construction management and provides a process that public administrations can use to determine whether and how they want to use construction management. Guidelines and a process are outlined for evaluating, selecting, and contracting to obtain construction management services. (Author/MLF)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

ED130420

U S DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

USING CONSTRUCTION MANAGEMENT

for Public and Institutional Facilities

EA 008 804

Public Technology, Inc., is a non-profit, tax-exempt public interest organization established in December 1971 as an institutional mechanism for applying available technologies to the problems of state and local governments. Sources of such technologies include federal agencies, private industries, universities, and state and local jurisdictions themselves. PTI works in both the hardware and software fields.

PTI works on specific problems that have been defined and given a high priority by state and local government officials. A problem also must be common to many units of government throughout the nation and one that is susceptible to technological solution. In this way two major organizational goals are realized: (1) Costs and benefits of large-scale undertakings are shared, and (2) private investment in the solution of public sector problems is encouraged by the aggregation of specific markets at the state and local levels of government.

The technology application process consists of these steps: problem definition, location of applicable technology, appropriate packaging of the technology for state and local governments, and help in adapting and implementing the technology at the operating level. Emphasis is placed on transfer and subsequent utilization of the technology by the largest possible number of jurisdictions. On-site assistance is provided, upon request, to make certain that state and local jurisdictions fully utilize the technology.

PTI was originally organized by the officers of the Council of State Governments, International City Management Association, National Association of Counties, National Governors' Conference, National League of Cities, and U.S. Conference of Mayors.

USING CONSTRUCTION MANAGEMENT FOR PUBLIC AND INSTITUTIONAL FACILITIES

Prepared for

U. S. General Services Administration
Public Buildings Service
Office of Special Studies and Programs
Washington, D. C. 20405

by

Public Technology, Inc.
1140 Connecticut Ave., N. W.
Washington, D. C. 20036

March 1976

$6.00

This publication was prepared for the U. S. General Services Administration, Public Buildings Service; which sponsored its preparation under contract GS-OOB-02104. The material contained in this publication does not necessarily reflect the views of the General Services Administration.

ACKNOWLEDGMENTS

The input and assistance of many groups and individuals have contributed to the development of this publication on construction management. The General Services Administration, Public Buildings Service (PBS), contracted with Public Technology, Inc., to explore the possibility of a formal program for exchange and transfer of innovative building technologies between state and local governments and the Public Buildings Service. This document is the first to emerge from this sharing and exchange effort and relies heavily upon procedures, documentation, and review comments contributed by PBS.

The Construction Technology User Requirements Committee was formed in conjunction with the PBS construction technology exchange program. These individuals from state, local, and Federal agencies with construction responsibilities are listed below and deserve appreciation for their assistance in preparation and review of this document.

William Bird, Director, General Services Administration, Metropolitan Dade County, Florida

Joseph Christian, Chairman, New York City Housing Authority

William Dripps, Chief, Bureau of Buildings, Washington, D. C.

Glen Hopkins, Deputy City Manager, Kansas City, Missouri

Robert H. Jones, Executive Director, General State Authority, Commonwealth of Pennsylvania

George Kern, Director, Architectural Division, San Diego County, California

Donald LeFevre, Eastern Regional Manager, IBM Real Estate and Construction Division; formerly Executive Director, Capital Development Board, State of Illinois

Frank Matzke, Executive Director, Capital Development Board, State of Illinois

Edmund McAdam, Director of Construction, Massachusetts Bay Transportation Agency; formerly Project Engineer, Bureau of Building Construction, Commonwealth of Massachusetts

V. W. Ostrander, Acting Director, Special Studies and Programs, Public Buildings Service, U. S. General Services Administration

Robert Parkinson, Director of Public Services, Columbus, Ohio

Alfred Petty, Superintendent of Buildings, Seattle, Washington

Neil Steinhoff, Administrator, General Services Division, State of Wisconsin

Vladimir Wahbe, Secretary, Department of Planning, State of Maryland

Martin Walsh, Director, Department of Building and Inspection, Cincinnati, Ohio

Technical Advisors

Joseph Newman, Senior Vice President, Tishman Research Corporation, New York City

Joseph Stein, Vice President, Tishman Research Corporation, New York City

We especially appreciate unified review comments prepared by a specially appointed task group of the Continuing Joint Conference on Construction Management of the American Institute of Architects, American Consulting Engineers Council, and the Associated General Contractors of America. This review is noteworthy as it was among the first external activities undertaken by the Continuing Joint Conference. For this review we appreciate the comments of many construction managers and especially the cooperation received from the individuals appointed to the task force, including:

George T. Heery, FAIA (AIA)
Frank Muller, P. E. (ACEC)
Rolland M. Wilkening (AGC)

Officials from state, local, and the Federal government who have reviewed and commented on the report include:

Joseph Baker, City Manager, Burbank, California
Robert Blake, U. S. Department of Health, Education and Welfare
Donald McIntyre, City Manager, Pasadena, California
Virgil Ostrander, U. S. General Services Administration, Public Buildings Service
John Stone, Building Inspection Department, Denver, Colorado

Further appreciation is expressed to the many state and local governments, construction management firms, and other organizations that have cooperated with Public Technology, Inc., in developing this document by providing background data and/or review comments.

Special thanks is expressed to Tishman Research Corporation; the Council of Educational Facilities Planners, International; and the construction management committee of the Technology Assessment and Utilization program of the National Academy of Science and National Academy of Engineering.

Collection of background information, questionnaire design, and tabulation of results was aided by Warren Fairbanks and Kevin Hastings of Worcester Polytechnic Institute.

Public Technology, Inc. March 1976

TABLE OF CONTENTS

	Page
Summary and Overview	1
The Problem	3
The Construction Management Approach	5
How Construction Management Works	9
Predesign Construction Management Services	9
Design Phase Construction Management Services	10
Construction Phase Construction Management Services	12
Users of Construction Management	17
Private Sector	17
Federal Government	17
State and Local Government	18
Determining the Applicability of Construction Management	21
Cost-Effectiveness Criteria	21
Project Scale Evaluation	23
Partial Utilization of Construction Management	23
Details in Considering Construction Management Arrangements	25
Construction Track Record	25
Evaluating Project Status	25
Legal Review	25
Detailed Functional Requirements	27
Project Cost Limits	30
In-House Capabilities	34
Dialogue with CM Firms	35
Obtaining CM Services	35

Table of Contents - continued

	Page
Initial Project Notice	39
Construction Manager Questionnaire	39
Evaluation and Selection	40
Contract Negotiation	42
Fee Basis	42
Using Construction Management -- What Needs to be Done	43

LIST OF FIGURES AND TABLES

Figures — Page

1. Traditional and Construction Management Approaches to Project Organization 7
2. Traditional Versus Phased Construction 14

Tables

1. Why Construction Management Is Used 6
2. Typical State and Local Government Projects That Have Employed Construction Management 20
3. Cost Justification Criteria 22
4. Rules of Thumb for Construction Management Use 24
5. Summary of Questionnaire on Use of Construction Management Method of Contracting 26
6. Detailed Construction Management Functions 28
7. Assignments of Typical Construction Management Responsibility 32
8. Construction Cost Limiting Methods 36
9. Construction Management Expertise Areas 38
10. Suggested Requirements of Construction Manager 41

APPENDICES

A. Sources for Further Information 47
B. GSA Policy on Construction Management 49
C. The AGC/AIA/ACEC Position 57
D. Sample Project Notice 59
E. Sample Request for Qualifications Submission 61
F. Construction Manager Questionnaire 65
G. Sample Construction Management Contracts 73

SUMMARY AND OVERVIEW

Public agencies are under increasing pressure to save time and money in developing new public facilities. Factors such as inflation, the energy crunch, strikes, and generally more complex facility requirements, however, have made these goals more difficult to achieve.

Construction Management (CM) has been developed as an alternative to the traditional public building process. Construction management seeks to save an owner time and cost primarily through better activity coordination and project management. Many private developers and major Federal agencies, including the General Services Administration (GSA) and the Department of Health, Education and Welfare - along with many state and local jurisdictions - have found that construction management can help to save time, money, and aggravation for the building owner.

Savings with construction management have been impressive in many instances. GSA reports design and construction time savings of up to two years on certain projects. Several public agencies report time savings of more than six months. These savings developed by reducing the impact of inflation, cutting costs for interim construction loans, reducing contingency amounts in contractor bids, and shortening rental periods for temporary agency quarters, prior to occupancy. Each of these factors saves real dollars. Certain techniques available through the use of construction management make a major contribution to these savings. Value Management, for instance, can be used effectively by the construction manager in this system and has produced consistent savings of 8-to-1 over the cost of its use. Value Management is described later in this publication.

The construction management technology centers on utilization of a construction manager who coordinates and manages the building process. The construction manager acts as a fiduciary for the owner, a fact which makes the project a cooperative team effort rather than a proceeding among adversaries, a situation which is not uncommon in public sector construction. These relationships are backed up by Critical Path Method (CPM) or PERT scheduling, detailed cost estimating, and cost accounting. These techniques are often computer-based, and a competent construction manager will use them with great effectiveness to control a project.

Public Technology, Inc. has evaluated construction management as it is used by state and local agencies for general public buildings and for educational facilities. The study indicates that this technology has been used on numerous projects with general success. Most users (76%) would consider using construction management again.

The usefulness of construction management increases in proportion to project complexity and cost. The total construction management approach can be used on a cost-effective basis for complex projects with construction costs of $3 million and above. On the other hand, individual parts of construction management technology, such as Value Management, may be applicable and can yield real cost benefits on projects costing $1 million and often less.

Several public developers report that they perform construction management functions in-house. Most, however, obtain this service from an outside firm under a professional service contract. In those cases where construction management was not considered to have been a success, problems were traceable to selection of an ineffective manager or to unworkable and ambiguous contractual relationships. This publication is designed to help you avoid such failures.

USING CONSTRUCTION MANAGEMENT was developed to guide public agencies in their evaluation of construction management for their particular needs. It describes the several forms of construction management and provides a process which public administrations can use to determine whether and how they want to use construction management. The publication will help any interested public development agency to employ a good construction manager, under the right contract. The administrator and other decision-making officials will find here guidelines and a whole process outlined for evaluating, selecting, and contracting to obtain construction management services. Jurisdictions without extensive construction experience may wish to choose an experienced consultant to assist them with the decisions.

The U. S. General Services Administration, Public Buildings Service (PBS), sponsored an experimental project conducted by Public Technology, Inc., to exchange and share innovative building management and construction technologies between state and local governments and the Public Buildings Service. USING CONSTRUCTION MANAGEMENT developed as part of this effort. The contents of this publication were developed by Public Technology, Inc., and are based upon inquiries to about 200 public building agencies, design professionals, contractors, and construction managers.

THE PROBLEM

Disciplined, yet flexible, management of budgets, costs, schedules, and participant involvement in complex public construction projects has become increasingly important for state and local governments and public agencies. Pressing demands for additional public facilities and tight construction budgets have heightened the need for construction programs that can produce new facilities within tight time constraints at reasonable cost.

Obstacles to time and cost saving, however, have also continued to grow for major public construction projects. Concerns such as increasing costs of materials and labor, environmental regulations, high interest rates, materials shortages, supply fluctations, new attention to energy conservation, regulations for using minority contractors, and other factors have dramatically increased in importance in recent years. Greater complexity in public building projects themselves has also made it more difficult to realize savings in time and cost. Financing and budget arrangements are frequently complex. Many public agencies and often private user groups may be involved with major projects each imposing its own requirements. Most of these concerns will be significant for major public building projects today. Any one of these concerns can become a real obstacle, getting out of control to skyrocket final construction costs and to delay occupancy in the new facility.

Coordinated management of the detailed financial and technical aspects of major building projects frequently is a weak aspect of the traditional public building process.[1] Cooperation among project participants may also be weak. Many in the field, for instance, note that the traditional building

---

[1] In the traditional public building process a local government agency acts as owner performing overall project administration, direction, scheduling, monitoring and management. In this capacity the agency can be termed "project manager". The owner contracts with design professionals to prepare drawings and other design documents. As the design phase is completed, the owner enters into a legal agreement with a general contractor who becomes responsible for the performance of construction work, usually for a lump sum amount. The general contractor normally subcontracts most of the work to other firms representing major construction disciplines such as structural, mechanical, electrical, interior finish and others.

process places the general contractor (seeking to make a profit on a fixed contract amount) in an adversary position to the owner and project design professionals. For example, though it could be beneficial it is not normally the contractor's interest or responsibility to provide cost-saving input to the project's design phase. Others note that when the design and construction phases are totally separate and sequential, the total time for the building process may be unnecessarily long, raising costs and producing a facility that may be partially obsolescent even before its completion. Still others believe that the sequential nature of design and construction phases in the traditional public building process by lengthening development time reduces the flexibility to adapt quickly to new developments in technology, and reduces the ability to forecast and adapt to construction problems, or fluctuations in labor and materials prices.

Public agencies without considerable construction experience may face an additional problem when they seek to build a major new facility - lack of experienced in-house personnel to manage the effort. Further, if the public agency does not anticipate a large continuing construction program, it may be unable to justify hiring necessary staff. Placed in this position, the agency may have no alternative but to turn to outside professionals for project and construction management expertise.

Overall, the problem is one of effective management of the public facility development process. The problem has many aspects - saving money, saving time, supplementing in-house capabilities, and organizing the functions of the many participants in a major facility development process so that the participants act as a team rather than as independent adversaries.

THE CONSTRUCTION MANAGEMENT APPROACH

Construction Management (CM) has developed in recent years as an alternative to the traditional building process. CM is especially applicable to the organization and management of major and complex construction projects. It has been used by many private developers, local and state public agencies, and federal agencies with general success. Because the Construction Management approach may be modified to assume many different forms, public agencies have used it on a variety of construction projects including buildings, bridges, roads, waste water plants, and transit systems.

In each application the basic thrust of construction management is to develop a "team" approach to building. The team approach coordinates the working relationships of the public agency developer, project design professionals, and an organization termed the "Construction Manager." The objectives of the new team relationships inherent in the construction management approach are to better coordinate the building process, to reduce adversary relationships, and to deal with problems and opportunities promptly where delay could bring on cost overruns. Table 1 lists benefits sought from construction management use.

Construction management differs in several important ways from procedures traditionally used for public sector construction. First, there is the involvement of a construction manager as a multifaceted professional group to provide project management services and to administer construction. Figure 1 illustrates this relationship. Second, the CM group brings significant construction expertise to the design phase to augment the capabilities of project design professionals. Third, the approach places great emphasis on integrating design and construction schedules, cost estimating, and cost accounting as management tools and makes the CM organization responsible for their use. Fourth, the construction manager is given many of the responsibilities traditionally assumed by a project's general contractor. Finally, awards will frequently be made for multiple prime construction contracts, rather than numerous subcontracts made under a single general contract.

Table 1

WHY CONSTRUCTION MANAGEMENT IS USED

TO COORDINATE DIVERSE CONSTRUCTION FUNCTIONS ON MAJOR PROJECTS

- On major complex projects the approach integrates the skills of in-house staff, consultants, design professionals, and building experts into a team effort.
- Productive communication among design professionals, building contractors, consultants, and other professionals has been increased. The extent to which this is achieved will vary depending on the form of CM arrangements used.

TO REDUCE THE TOTAL TIME FOR DESIGN AND CONSTRUCTION

- Portions of building design and construction can be undertaken simultaneously upon a reliable and predetermined schedule.
- This helps to avoid long-term project uncertainties that can result from materials and equipment shortages, labor problems, and other construction delays.

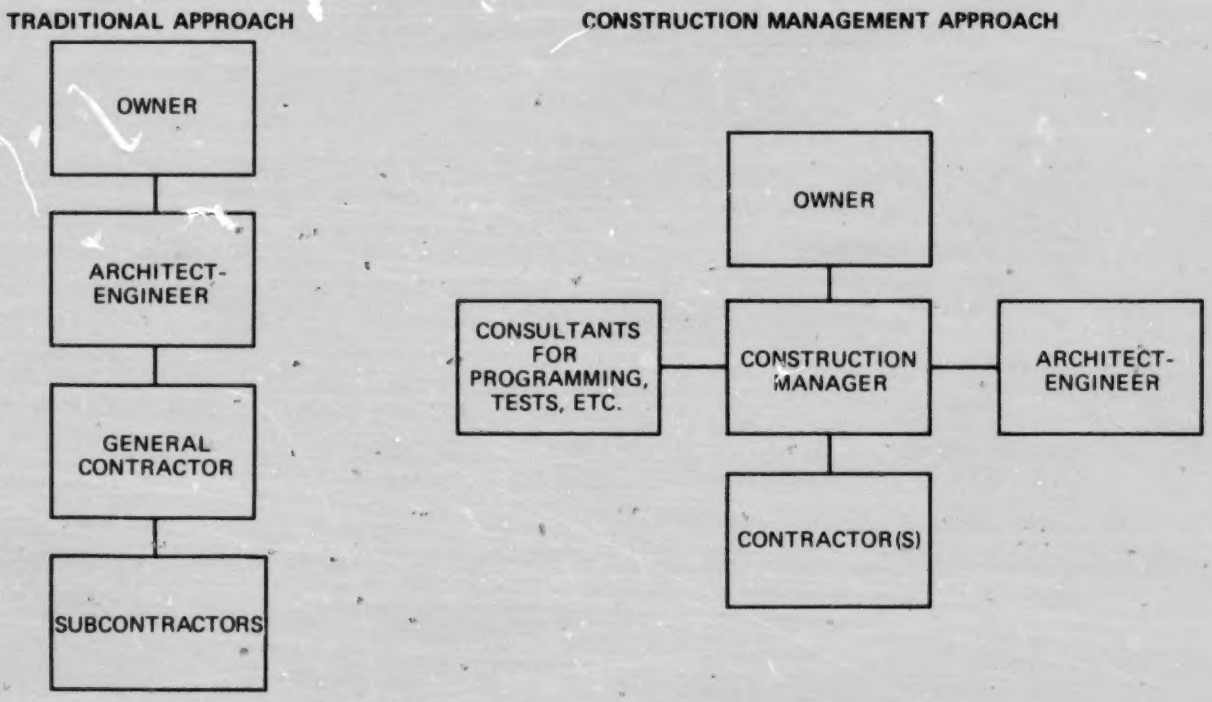
REDUCE CONSTRUCTION COSTS

- Introduces extensive cost control efforts at the earliest stages of pre-design and design-including cost estimating, cost accounting, and value management.
- Identifies options involving cost and program scope at an early stage.
- Helps to counteract cost of inflationary trends and reduces the cost of financing by expediting design and construction.

TO INCREASE PROJECT FLEXIBILITY

- Shorter development times make it easier to forecast and adapt to construction problems which are related to design decisions.
- Possibilities for involving small or minority contractors can be enhanced if contracts for construction disciplines are let separately.

FIGURE 1
TRADITIONAL AND CONSTRUCTION MANAGEMENT APPROACHES TO PROJECT ORGANIZATION



NOTE: THIS CHART INDICATES FUNCTIONAL WORKING RELATIONSHIPS, NOT THE VARIOUS LEGAL CONTRACTS WHICH ARE IN EFFECT.

Though these are major changes from the traditional building process, existing legal constraints can still be met and several basic project functions remain essentially intact. Public bidding procedures can still be used for all actual construction work. In fact the CM approach generally increases competition by opening up the process to a greater number of qualified bidders. Responsibility for all design decisions remains with the project design professionals with concurrence from the owner. The owner retains final control of the building process, often being more involved in project decisions than would be the case if CM were not used.

Finally, construction management relationships can be developed which provide the owner with a contractually guaranteed limit on construction costs. As mentioned above, individual construction contracts can be of a publicly-bid fixed price nature. In addition, the contract of the construction manager can include several forms of guarantee for total project cost. This subject is discussed in more detail later in this document. For the moment, however, it can be noted that it may not be necessary for the public owner to secure cost guarantees from the construction manager. In fact, it may be counter-productive to require these guarantees.

HOW CONSTRUCTION MANAGEMENT WORKS

Construction Management (CM) refers to a type of contractual and professional working relationship initiated by a building owner for project design professionals and the construction manager. The approach can be applied to construction of a particular facility or for construction of several related facilities within an overall construction program. The construction manager may be an individual or group of individuals on the owner's staff. More frequently, however, the construction manager represents an outside firm or joint venture working as an agent of the jurisdiction acting in the owner's best interest under a professional services contract on a specific construction project.

Many variations of the construction management approach have been used by private developers and public construction agencies. Because of the special characteristics of each major building project and rules and regulations specific to each jurisdiction, no single form of construction management relationship will best suit the particular needs of all jurisdictions. Material presented later in this publication will assist public agencies in considering alternative approaches and in defining specific functions required of a construction manager. A broad overview of construction management services, however, is provided below. The aim here is to indicate the kinds of services a construction manager can provide rather than to specify any hard and fast rules for use of construction management services through predesign, design, procurement, and construction phases of a project.

Construction management is most effective when employed from a project's predesign stage through construction until final occupancy. It is possible, however, to employ construction management services for only a single phase of a project, but the benefits of the approach may not be fully realized.

Predesign Construction Management Services

If the public agency determines to use an outside group for CM services, the construction manager may be placed under contract even before the selection of project design professionals. In fact, one of the first functions

of the construction manager may be to assist the agency in placing the project architect/engineer under contract Alternatively, if the design firm is selected first, it may be one of its tasks to assist the owner in contracting for construction management services Either way, it is essential that the construction manager and the design professionals work closely together with non-conflicting contractual responsibilities. Some developers avoid this problem by contracting with project design professionals to provide CM services.

During a project's predesign phase, the construction manager can aid in planning, programming, budgeting, and scheduling The construction manager can act to correlate the input and requirements of the several public agencies with an interest in the project. Preliminary budget analysis of the project and assistance in site selection may also be performed by the construction manager. Perhaps one of the greatest contributions construction management services can make during the predesign phase is to review basic requirements for the facility with the owner and design professionals to assure that the owner's real needs will be met effectively within the allowable budget.

During the predesign phase of a project the expertise and diversity of possible services of the construction manager can be used by the owner to back up in-house project managers and to complement the capabilities of the project design professionals. Each public agency, having individual needs, will require differing services from its construction manager Serious attention must be devoted before design and construction management agreements are signed to assure that all necessary predesign functions will be completed without conflict or overlap by either the owner, the design professional or the CM, but all working together as a team.

Design Phase Construction Management Services

Many past users of construction management believe that the greatest benefits from using the approach occurred during the project's design phase since flexibility remains allowing for major cost and time saving modifications. The construction manager's emphasis at this stage in the building process is to provide continuing project management, to coordinate the building process, develop schedules, and to review designs and specifications to save the owner construction time and money. Another important function is to develop cost models and component budgets.

During a project's design phase the responsibilities of the construction manager do not include performance of actual design decisions The CM will review designs, but final decisions are made by the design professionals and the owner. Prime responsibilities of the CM are to keep design activities on

schedule, to develop construction schedules, and to provide expertise to reduce and control costs The cost control function of the construction manager has two very important parts: (a) cost estimating and (b) value management.

Greater emphasis is placed on cost estimating as a management tool under CM than is common with traditional project administration The construction manager reviews estimated and actual construction costs as an independent party, often using computers extensively. Construction cost control (and budget control) is a basic function of the construction manager, not a secondary function. The construction manager's familiarity with detailed labor and materials costs and typical cycle times is usually greater than most design firms. Cost estimates are regularly provided to the project design professional and the local administration throughout the design phase as a major feedback for evaluating whether the design is within desired cost boundaries. On certain projects a representative of the construction manager will work full time in the design professional's office to speed the exchange of information on cost estimates.

Value Management is the second design phase approach to cost control. Though discussed here as a distinct form of cost control, many construction management organizations integrate value management into their overall cost control services. Value Management is an organized and vigorous search directed at the analysis of requirements for achieving essential functions at the lowest total cost, consistent with needed performance, quality, reliability, aesthetics, safety, and operation. Value specialists routinely expect that project savings they suggest will exceed the cost of their services by a factor of eight to one. GSA Public Buildings Service reported $10 million in savings for 1974 from value management programs with a return on its investment of nearly thirteen to one.[2]

Construction management organizations are well-suited to provide value management advice on construction projects as they can take an independent look at design progress using the wealth of construction knowledge and design knowledge at their disposal. Typical value management examples could include properly sized heating and cooling equipment for life-cycle cost and energy savings; information for choosing the most economical structural system; advice to modify a design to speed construction sequencing; and advice on the most economical interior finishes and partitions, based on initial cost and projected maintenance costs.

Much of the construction management activity that takes place simultaneously with design is directed toward scheduling and coordinating the

2 FY 1974 Value Management Annual Report, Public Buildings Service, U. S. General Services Administration.

construction process. Overall project schedules including both design and construction phases are prepared by the construction manager. Great emphasis is placed on these schedules as management tools to increase project efficiencies. As design progresses the construction manager develops a plan for separating construction work into an integrated set of construction contracts. Work is frequently separated by construction disciplines - heating, electrical work, finishes, etc. On the other hand it may be desirable to separate some construction work in terms of assemblies within the facility. This would be appropriate if a given assembly (e.g., an air diffuser with built-in lighting) could best be installed by a single contractor with multiple capabilities (e.g., heating and electrical work).

Other concerns may enter the decisions on separation of construction contracts. For example, laws or policies on the use of local firms or small businesses and minority contractors are often important in forming a plan for separating construction work and developing contracts. Overall, the goal of the construction manager in developing this plan for construction contracts is to assure that all necessary construction work can be contracted out in the owner's best interest. As prerequisites, each construction firm must be able to carry out its portion of work efficiently, and problems such as overlapping trade jurisdictions must be avoided.

As the plan for separating construction work is developed and approved by the owner, the construction manager develops bid packages for the work, conducts briefings, and finally assists the owner in selecting competent firms that have submitted responsible low bids.

Construction Phase Construction Management Services

Though the construction phase is discussed here as a separate activity, a major aspect of construction management is that it facilitates integrating schedules for both design and construction into a smooth process. In doing so, the construction manager can usually reduce the total time between the start of design and the completion of construction to save the owner considerable cost. Time savings have frequently exceeded six months. Technically this approach is called "phased design and construction" or simply "phasing." ("Fast tracking" is often used in popular jargon to mean phased design and construction, but has often been a misused term.) Phased design and construction has been difficult to exploit within the traditional building process and often becomes one of the reasons why public agencies and private developers choose to use the construction management approach. Grant constraints and other financial reasons more commonly prevent phasing in traditional project

arrangements than do technical constraints.

The procedure for phased design and construction is illustrated diagrammatically in Figure 2. Briefly, the procedure works as described below. Procurement of long lead time material (e. g., steel) and equipment often will begin long before the design phase is complete. Similarly, off-site fabrication of special assemblies and components will also be started at an early stage. Then, as design progresses, construction contracts for various portions of the facility such as excavation, foundations, and steel work will be competitively bid and let so that each portion of construction can be initiated at the earliest possible time. In this way construction procurement and actual construction can often begin about one-third through the design phase.

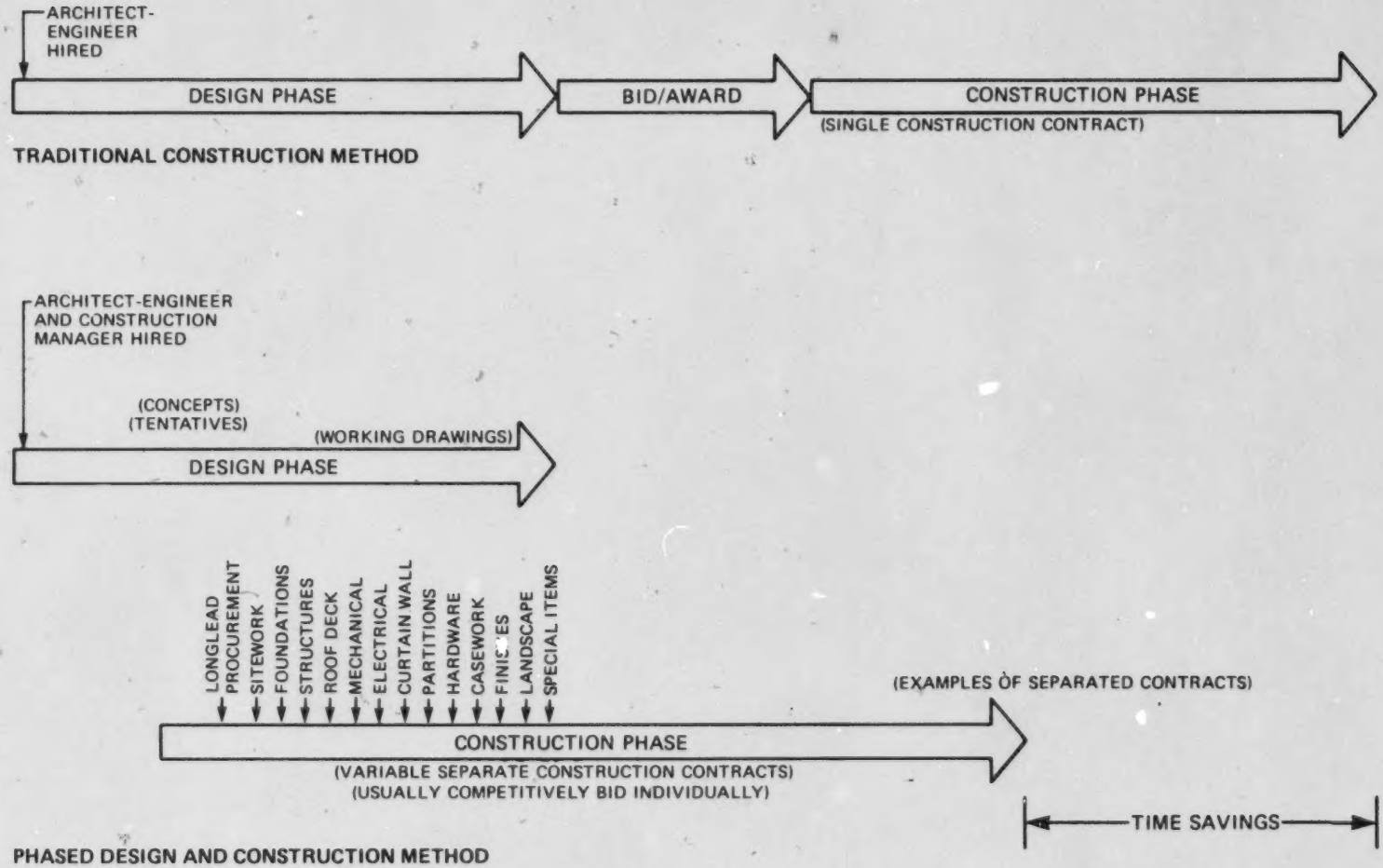
The early start of construction under phased design and construction procedures may pose difficulties for some public agencies. For example, relevant local, state, or supporting federal agency rules or regulations may require that all design documentation is complete before construction begins or that nearly all construction work is let as a single lump-sum contract. In several cases, however, local jurisdictions have found that these constraints may be subject to interpretation or may be modified for the project at hand.

An additional problem can arise under phased design and construction procedures with current building permit and plan review procedures in certain jurisdictions. Several major cities, however, such as Denver, Colorado, have made administrative changes to building code procedures to accommodate phased design and construction. The changes allow partial building permit issuance (e. g., "foundation-only" or "structure-only"). The modified procedures have been successful, but may place a greater than normal work burden on the building regulatory agency depending on local procedures. Permit fees for phased design and construction, therefore, may be higher than for the traditional building process.

Phased design and construction is routine under construction management, but is not a necessary aspect. Before a decision is made the jurisdiction should discuss this subject with the project design professional since it requires the designer to have a solid conceptualization of the project at an early stage and may increase the firm's work load. Legal counsel also should be contacted.

During construction, the construction manager is responsible for administering the progress of construction contracts. In public sector construction, the construction manager frequently is not engaged to perform any of the actual construction work. This is done so that all construction

FIGURE 2
TRADITIONAL VERSUS PHASED CONSTRUCTION



work will be competitively bid and to avoid possible conflict of interest. However, tied in with the responsibility to administer the construction contracts there usually will be a series of related functions including, but not limited to cost accounting, overall control of the construction site, site security, maintenance of records, and inspections. It should be noted that the inspections conducted by the construction manager are in addition to the periodic inspections made by project design professionals and regulatory officials and are, in general, to be more frequent and more detailed (e. g., "Clerk of the Works" inspections).

In the discussion above, the goal has been to present an overview of the construction management approach. More detailed listing of these services can be found in later sections of this document and by consulting the references described in Appendix A. Repeating several major points, the construction manager works as a professional agent of the owner to control costs and budgets and to coordinate all activities within an efficient schedule. During design the construction manager provides cost control through value management and preparation of detailed cost estimates. During the construction phase (which under phasing procedures may be initiated before the end of the design phase) construction management services normally include administration of all construction contracts, coordination of schedules, cost accounting, and often general control of the construction site.

USERS OF CONSTRUCTION MANAGEMENT

Private Sector

Construction managers are frequently utilized by private industrial and commercial developers to provide management and construction expertise not available in-house. The contracting methods embodied in a construction management agreement, such as phasing, early procurement of long lead time material and equipment, and cost control affecting the design process, have enabled private owners and developers to continue construction despite unfavorable economic climates and low availability of financing. Several large projects of the private construction industry that serve as typical examples of use of CM techniques are:

- Sears Tower, Chicago
- Johns Manville World Headquarters, Denver
- Mountain Bell Telephone, Denver
- Renaissance Center, Detroit
- Farmland Industries Phosphate Plant, Florida
- American Telephone and Telegraph Building, Bedminster, N.J.
- Ochsner Medical Foundation, New Orleans
- First National City Bank Building, New York City

Federal Government

The Public Buildings Service (PBS) of the General Services Administration reviewed the use of construction management techniques in 1970. PBS concluded that the traditional lump sum general contracting method then in use was no longer acceptable for the majority of the PBS building projects because of time delays and cost factors.[3] Since 1970, PBS has used construction management on most projects with construction costs in excess of $5 million when PBS has directed the building process. The $42 million National Air and Space Museum, turned over to the Smithsonian Institution in 1975, is a showcase of the CM method used by GSA. Other large projects where GSA has used CM include three Social Security Payment Centers in Philadelphia, Chicago, and San Francisco with a total cost of $97 million.

---

3 Construction Contracting Systems, a study by the Public Buildings Service of the General Services Administration, March, 1970.

As a major user of construction management, GSA has done a great deal to shape the techniques to the requirements of public agencies. GSA's current policy on construction management is reproduced in Appendix B.

The U. S. Department of Health, Education and Welfare (HEW) uses construction management in a different format than does GSA. The modified form used by HEW is termed Construction Management with Guaranteed Maximum Price (CM-GMP). Guaranteed Maximum Price is discussed later in this document under "Project Cost Limits." HEW also encourages CM-GMP usage in federally assisted construction programs for hospitals, schools, and laboratories where the owner is a state or local government entity or nonprofit agency. Over a period of four years a construction volume of $2 billion has been built under CM-GMP procedures. An HEW official has reported to PTI that this program has yielded impressive savings in time and cost. Though most applications of CM-GMP are for projects with construction costs of several million dollars, HEW has applied its version of construction management successfully at times on alteration projects with costs below $1 million. On these projects, the complicated scheduling of transient moves in coordination with construction justified use of the CM approach.

State and Local Government

The first known application of construction management was for public construction in the State of New York. Construction management developed there as a mechanism to manage the multiple construction contracts required by state law for large public construction projects.

To investigate state and local public agency use of construction management, PTI conducted a survey of its application for general public buildings and educational facilities.[4] Overall, the survey of selected state, county, and city public building and school authorities indicated that construction management had been used on a large number of major construction projects-usually with success. Most users (76%) would consider application of the technique again. Table 2 lists several state and local jurisdictions reporting use of construction management.

---

[4] Agencies responsible for construction of educational facilities were surveyed through the cooperation of the Council of Educational Facilities Planners, International, Columbus, Ohio.

The volume and complexity of public jurisdiction construction projects and the capabilities of in-house staff are major factors in determining applicability of construction management. Among authorities responsible for educational facilities, for example, only 17% of those jurisdictions surveyed having construction projects of $3 million and below in the past ten years had utilized construction management. Among jurisdictions having more than $9 million in construction, however, a full 61% had utilized construction management on one or more projects.

Apparently because of its historical development, construction management has been used most widely on the East Coast, and less in western states and localities. Among public building agencies in the Northeast having construction projects over $3 million, 71% had utilized construction management in some form. In the West only 39% of those agencies with $3 million or more in facilities construction projects had used construction management. In educational facilities, of four western jurisdictions with $9 million or more in construction, none of those surveyed reported use of construction management. Combined results for the Northeast and South, however, indicate that among large builders of educational facilities (over $9 million), seven had used construction management and five had not.

Table 2

TYPICAL STATE AND LOCAL GOVERNMENT PROJECTS THAT HAVE EMPLOYED CONSTRUCTION MANAGEMENT

- Birmingham, Alabama - a $50 million Cultural Center
- Pasadena, California - a $20 million conference center
- San Diego, California - a $24 million school construction program
- Denver County, Colorado - projects ranging from $1.5 million to $14.5 million
- Hartford, Connecticut - projects from $3.1 million to $18 million
- Broward County, Florida - for six schools
- Cobb County, Georgia - for three schools ranging from $3 million to $5 million
- State of Illinois - projects ranging from $2.1 million to $60 million
- Maryland State Department of Education
- University of Massachusetts - $135 million first phase of the Boston Campus
- Pontiac, Michigan - new $55.7 million Detroit Lions football stadium - saved the budget from overruns, and 21.5 months on construction time
- Jersey City, New Jersey - $30 million water works project
- New Jersey College of Medicine and Dentistry and other projects, costing from $3 million to $200 million
- Trenton, New Jersey - projects ranging from $300,000 to $1.5 million
- State of New York - projects ranging from $100,000 to well over $100 million
- New York Port Authority, Newark Airport Terminals
- New York Port Authority, World Trade Center - a $250 million project
- Forsyth County, North Carolina - an $8 to $10 million hospital expansion project
- Ohio Office Building Authority on its Columbus State Office Building - indicated time saving of six months
- Cleveland, Ohio - for municipal airport
- Abington School District, Pennsylvania
- University of Pennsylvania on a student housing project - completed in half the usual time
- Orange, Texas - Housing Authority rehabilitation project
- Arlington County, Virginia - a $4 million project
- Fairfax County, Virginia - projects ranging from $24 million to $102 million

DETERMINING THE APPLICABILITY OF CONSTRUCTION MANAGEMENT

Several factors described below should be incorporated into the decision by a local jurisdiction on the applicability of construction management to a specific project. Each has significant impact in choosing the appropriate form of construction management and the capabilities required of the construction manager. Like any new procedure the first decision by a local jurisdiction on construction management use requires policy consideration by top-level personnel. Departmental organization and procedures may need modification, laws may require amendment, and it may or may not be possible to perform construction management with in-house staff. For these reasons, local administrations should involve both executives and technical experts in construction management decisions. Jurisdictions may find that it is to their advantage to commission a consultant with considerable CM experience to help with these determinations. They also may get input from several successful construction management users in state and local governments and from several firms offering construction management services.

Cost-Effectiveness Criteria

The services of a construction manager normally have a cost in the range of 1/2% to 6% of estimated construction costs depending upon the functions assigned to the construction manager and a project's size, scope, and risk factors. Most construction management fees, however, fall in the middle of this range - between 2% and 4%. Low fees (such as 1/2%) may be appropriate for example for limited services such as scheduling. Higher fees (e.g. 6%) may be appropriate if the construction manager is exposed to contractual risk or must provide a resident engineer on the project. Clearly, the approach will have been useful only if savings substantially exceed the construction manager's fee. It is impossible, however, to predict beforehand savings that a construction manager can achieve - or disastrous cost and time overruns that can be prevented. The particular characteristics of the construction project, the capability of the construction manager, and many unforeseeable variables such as strikes are tremendously important. Keep in mind that no contract, either a traditional general contract or any guarantee by a construction manager, truly guarantees that the project will not suffer if serious problems develop. Though lawsuits may recoup some damages, there are costs and delays that will still hurt the public agency.

Table 3 lists sources of cost savings that users have reported with construction management. While results cannot be quantified until the project

Table 3

COST JUSTIFICATION CRITERIA

Among the issues that should be considered in deciding the cost-effectiveness of construction management contracting are:

- Inflation - With construction costs increasing at the recent inflation rates of .5% to 1% per month, reduction of design-construction time can bring substantial savings.

- Reduced need for temporary quarters - For an owner currently renting space, each month saved in construction time translates into one month less payment for rented space. Conversely, a public agency acting as owner can receive user charges from tenant agencies at an earlier time.

- Finance costs - Contractors normally incur substantial costs for interim financing of their work prior to payment by the owner. If design and construction time can be reduced, interest charges for short-term finance can also be cut.

- Efficient and reliable planning - Rigorous planning and adherence to design and construction schedules can reduce the need for contingency funds carried in contractors' bids and may lead to bid packages with a lower total cost.

- Reduction of adversary relationships - As an independent agent usually not exposed to the risks of bidding, the CM is able to freely lend knowledge and expertise and actively protect the owner's interests. Note that introduction of risk (e. g., Guaranteed Maximum Price) may jeopardize the fiduciary relationship.

- Increased construction cost awareness during design - The greatest potential construction savings can occur during the design phase. Close working relationships between design and construction experts, inherent in the team approach, increase construction cost awareness and value management during design.

- Avoid unnecessary long-term staffing - If an outside firm provides CM services, the jurisdiction can avoid maintaining underutilized in-house professional staff during future lull periods in construction activity.

is completed, the local administration can consider these factors while defining the tasks of the construction manager and can use them while evaluating the benefits realized from the approach following project completion.

Project Scale Evaluation

Construction management does not apply to minor construction efforts where costs are not great and tight schedules do not impose major constraints. The PTI evaluation of construction management has produced the guidelines listed in Table 4 based on public agency experience. The local administration can use these estimates to determine if construction management should be seriously considered for the project at hand.

Partial Utilization of Construction Management

In considering the items above, the public agency may determine that full utilization of the construction management approach may not be feasible for the project at hand. If this is the case, the agency may choose nonetheless to utilize certain construction management services and to apply basic principles of the construction management approach.

Value management during design bears special consideration in this regard. Frequently public building agencies will utilize in-house staff or will commission project design professionals to perform value management for new or renovated facilities often with excellent cost saving results. The public developer may also consider acquiring value management services from an independent outside group with considerable construction expertise. The goal here would be to obtain value management input from a construction oriented group that can complement the detailed construction knowledge of project design professionals, reviewing design decisions from an unbiased position.

Cost estimating is another function emphasized in construction management that may be applicable to projects where the total CM approach is not feasible. Project design professionals traditionally develop detailed statements of probable cost and in some instances detailed estimates as one of many services to an owner. The public agency may also seek an independent cost estimate as a means to assure the precision of cost projections and thus prevent overruns.

Overall, the single most important strength of the construction management approach is its concern for rigorous project management, dealing with problems and opportunities expeditiously and assuring that the

public agency is constantly aware of project progress and its cost and time impact. Careful review of in-house project management capabilities may indicate areas that should be strengthened through hiring or contracting with an outside firm.

Material in the later sections of this document is primarily useful for establishing full construction management relationships. It may also be of assistance to public agencies seeking to employ certain aspects of the approach.

Table 4
RULES OF THUMB FOR CONSTRUCTION MANAGEMENT USE

- The approach is definitely applicable on projects over $5 million.
- The construction management approach bears serious consideration for projects of $3 million and above and probably will be cost-effective.
- Separation of multiple construction contracts is unlikely to be cost-effective on projects below $3 million unless special schedule requirements and project complexity are major concerns.
- Specific elements of construction management services such as value management may prove beneficial on projects with construction costs as low as $1 million and/or with special scheduling requirements.
- These cost guidelines should not be interpreted as hard and fast rules. The particular requirements of the given project must be considered prior to any final decision on construction management use.

DETAILS IN CONSIDERING CONSTRUCTION MANAGEMENT ARRANGEMENTS

Construction Track Record

Once the general criteria above have been satisfactorily accounted for, the local jurisdiction or state agency should review its performance history on past projects with emphasis on final construction cost before choosing a particular form of construction management. The following questions may be helpful. How accurate were cost projections? Did substantial overruns occur and if so, why? Were there significant disputes between design professionals and contractors? Were there real value management achievements? What period of time elapsed between the start of the design process and final occupancy? What were the major time elements involved? Who was responsible for delays? How do the jurisdiction's past construction efforts compare with those of other nearby jurisdictions and private developers? Using judgment when making comparisons is important since no two building projects or circumstances are the same. Construction environment factors such as inflation, interest rates, strikes, and material price fluctuations are significant.

Evaluating Project Status

Construction management yields greatest benefits when it is initiated at or even before the start of the design phase. The particular project, however, may be well into design before the local jurisdiction becomes interested in construction management, perhaps because of anticipated cost overruns, etc. If the project has been initiated already, the local administration should consider whether new procedures and the personality of a construction manager may in themselves cause problems such as delays or may instead be beneficial.

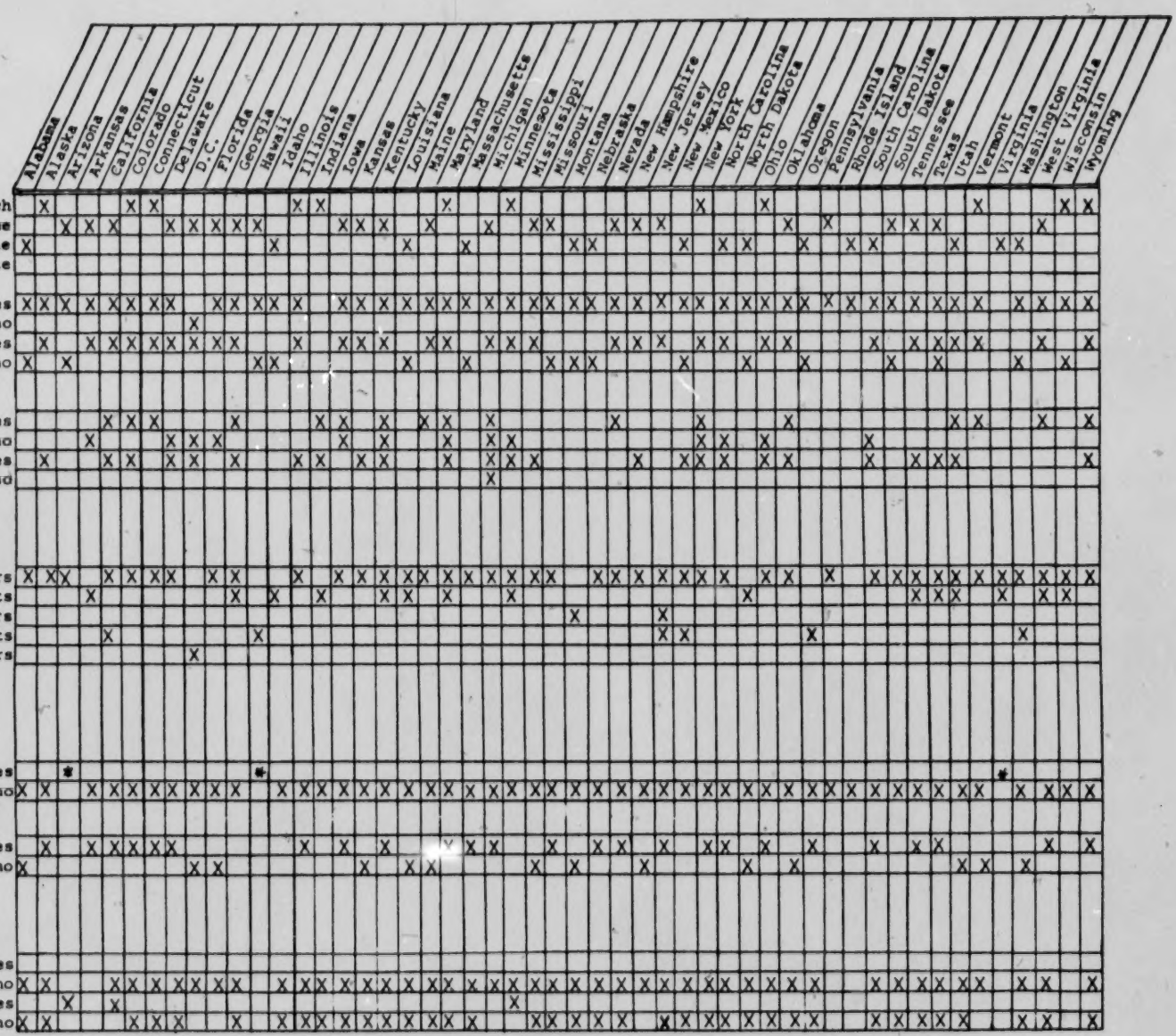
Legal Review

Legal counsel should determine if real barriers exist to utilization of various construction management techniques. About 30% of all jurisdictionss responding to the PTI survey noted apparent legal constraints; 15% of the

Table 5

Summary of Questionnaire on

USE OF CONSTRUCTION MANAGEMENT METHOD OF CONTRACTING



* Responded that state requires competive bidding on public work

October 1975
Associated General Contractors

users reported that modifications of laws or regulations were necessary before they could use construction management. Legal restrictions may be subject to considerable interpretation in certain instances. This is made clear by a recent survey by the Associated General Contractors of America, included in Table 5. Note that the construction managers polled did not perceive legal obstacles to be prohibitive, especially since construction contracts can be bid competitively under construction management procedures. This agrees with the belief of many construction managers that the approach can be adapted to fit specific legal requirements that exist within nearly all jurisdictions.

Important initial legal concerns include the following: Is it currently possible to commission a private firm as a construction manager in a professional capacity? What means are available for fee setting? Do current construction requirements require that all construction work be bid and let on a lump sum basis? Is it a requirement that a general contractor with some sort of registration or license assume contractual responsibility for total construction work? Are there current building code provisions or procedures that may be problematic, particularly in relation to the use of phased design and construction?

Detailed Functional Requirements

Table 6 lists in detail functions that are typically performed by a construction manager during the predesign, design, and/or construction phases of a project. The local administration can review these functions to determine whether each should be assigned to a construction manager on the project. The administration especially should evaluate whether the functions can be performed by current in-house staff. Input from executive level decision makers is important at this point.

The construction management functions listed in Table 6 are not new elements of the building process. In the traditional public building process all of the functions listed in Table 6 are accomplished by the owner, project design professionals, or the project's general contractor. Under construction management, however, task distribution and emphasis are changed so that these management, cost control, and construction control functions are vested in the construction manager acting in the interest of the owner.

In reviewing the list of functions that can be included within construction management arrangements, the jurisdiction considering use of the technique must pay prime attention to assure that CM services can be effective if they are to be used at all. Delegating one or a few of these activities to an

Table 6

DETAILED CONSTRUCTION MANAGEMENT FUNCTIONS

DURING PREDESIGN AND DESIGN PHASES

- Perform budgeting, programming, and scheduling including predesign economic trade-off studies for the owner.
- Assist the owner in putting the architect-engineer under a contract tailored to the project.
- Perform value management on building systems and equipment, specification and criteria requirements and alternative designs.
- Suggest new materials, technology, methods, constraints, and sequencing.
- Prepare and periodically update a project budget for the owner's approval and prepare trade-by-trade cost estimates or bid package cost estimates.
- Analyze procurement requirements and responsibilities for safety precautions, temporary site facilities, and equipment, materials and services for common use of contractors and ensure that these are included in the construction documents.
- Provide guidance on government requirements and special programs affecting labor and community relations.
- Determine applicable requirements for equal employment opportunity programs for inclusion in contract documents.
- Advise on the method to be used for selecting contractors and awarding contracts. If separate construction contracts are to be awarded, recommend separate construction functions to avoid jurisdictional overlap, verify that all necessary work is included, and allow for phased construction.
- Assist the architect-owner in presentation of design documents to public agencies as required.
- Prepare bid lists for approval by the owner and professional design team, and make certain that contractors are qualified and capable to perform.
- Assist the owner in pre-bid conferences, bid evaluation, and development of construction contract documents.

Table 6 - Continued

DURING THE CONSTRUCTION PHASE

- Administer construction contracts.
- Ccordinate in the owner's interest the work of contractors with activities and responsibilities of the owner and architect-engineer.
- Schedule and conduct progress meetings.
- Provide a realistic detailed schedule for operation of construction contractors.
- Provide regular monitoring and frequent inspection of work to determine progress and conformance with design documents.
- Revise and refine the approved estimates of construction costs, developing cash flow reports and forecasts as needed and maintain accurate cost accounting records.
- Expedite construction drawing preparation by the contractors, architects, and engineers.
- Provide project office administration.
- Provide site security.
- Review bills from contractors and suggest recommendations to the owner for payment.
- Recommend necessary or desirable changes to the owner and architect-engineer. Review change orders and value incentive proposals.
- Maintain project progress records.
- Assist the owner in checking out utilities, operational systems, and equipment prior to occupancy.
- Determine final completion and notify the owner and architect-engineer.

in-house or outside group calling itself a construction manager does not mean that the construction management approach is really being employed. Unless the construction manager is provided real responsibility in project management and administration of construction, the CM approach will not be effective and management problems are likely to result.

Table 7 illustrates variations of the construction management approach that have been employed in either private or public construction sectors. This chart may be of assistance in determining the functions of the construction manager for a project and especially to compare basic alternative approaches. Note that each of these approaches calls for varying capabilities from the construction management group (e. g., architectural vs. contracting strengths). Note also that an in-house construction manager cannot commit contractually to a cost limit figure (e. g., a Guaranteed Maximum Price) as many outside firms can. The question of whether the construction manager should be required to take this kind of risk is addressed later in this document.

Caution also should be exercised when considering use of a given set of construction management responsibilities and procedures used by another entity in either public or private sectors of construction. Each past and current user of CM has developed a set of task responsibilities which it considers appropriate for its specific needs. Large construction agencies often change their construction management procedures as their experience develops and their needs change.

Project Cost Limits

The approach that will be used by the public agency to limit construction costs on the project should be reviewed at an early stage in the consideration of construction management. Use of a particular cost limiting approach will have a significant impact on the type of CM services required and also on the type of construction management firm that will be able to participate. Alternative cost limitation approaches that can be used include: relegating cost accountability to multiple construction contractors, establishing a Guaranteed Maximum Price (GMP), and establishing a Fixed Limit on Construction Cost.

The first of these cost limiting approaches is used by GSA. It is the best of the three approaches for preventing the owner and the construction manager from becoming adversaries, as the construction manager is not exposed contractually to the risk implied in meeting a fixed end cost. Lower

risk will be reflected in the construction management fee. In this cost limiting approach the construction manager provides the owner with written cost estimates for construction work, but does not provide cost guarantees. The owner, therefore, must develop independent cost estimates to provide verification. These estimates can be prepared by in-house staff with experience in construction costs, by an outside cost consultant, and/or by other agencies providing financial support for the project. When financial support from other agencies is sought, the public agency grantee will submit the construction manager's estimates and independent estimates in lieu of a lump-sum general contract amount as evidence of funding need and ability to complete the project within cost boundaries.

In this first cost limiting approach each of the multiple prime construction contractors operates under a fixed-price, publicly bid contract for a specific portion of construction work. Thus all construction work will be performed under fixed price contracts. However, if phased design and construction is employed, several fixed price construction contracts may be issued and work will have begun before all aspects of construction work have been placed under contract.

In preparing a project budget there are reasons why the owner should base the budget upon the verified estimate of the construction manager rather than a summation of initial bid amounts submitted by the multiple construction contractors. The first reason is that the bids often contain exceptions to certain portions of plans and specifications. A second reason relates to timing and is based on the fact that cost and work differences will develop in the time between bid submission and the final award of each contract as a result of new estimates and contract negotiations. Often these cost differences will develop to the owner's benefit.

Guaranteed Maximum Price (GMP) is a second possible approach to construction cost limitation. It is used and advocated by the U. S. Department of Health, Education and Welfare and others. Under Guaranteed Maximum Price, the construction manager assumes contractual responsibility to ensure that construction work to meet all plans and specifications is achieved within an established maximum amount. Because this approach exposes the construction manager to risk, the construction manager must charge for this accountability. The General Services Administration does not advocate the GMP approach because of this risk factor, believing that it creates an adverse relationship between the owner and the construction manager that is detrimental to the project and basically unnecessary. Legal liability questions become important with the GMP cost limiting approach. Normal errors and omissions liability insurance carried by architects and engineers would not cover their assumption of GMP risk as construction managers.

Table 7
ASSIGNMENTS OF
TYPICAL CONSTRUCTION MANAGEMENT RESPONSIBILITY

CM SERVICE "A"

The CM provides cost analysis and estimating services during design phases. CM helps Owner and Architect/Engineer (AE) analyze how projects should be assembled into contract package.* CM handles scheduling of design and/or construction, frequently using computer programs. CM advises Owner and AE on cost factors of various construction materials and methods. CM does not design. CM assists in obtaining proposals and awarding contracts. Coordinates inspections by AE. CM coordinates full-time inspectors in employ of Owner or AE. CM administers** Owner-Contractor agreements. CM has no contracts for work in CM's name. CM does not direct superintendence of work within a contract. CM provides no labor, material, equipment, or operation thereof. CM directs no construction labor at the site employed by the Owner (see Table 6 for a more complete and detailed listing of CM functions).

CM SERVICE "B"

Same as CM Service "A," except that CM guarantees to the Owner the total construction cost and provides bond.

---

* Term "contract package" refers to the content of construction work with an Owner-Contractor agreement, whether for a portion of the project or all of the project (a general contract).

** Term "administers" is used herein to refer to advising the Owner and AE of the Owner's rights under Owner-Contractor agreement, coordinating correspondence and paperwork related to the contract, and processing payments to the contractor(s).

Table 7 - Continued

CM SERVICE "C"

Same as CM Service "A," except CM takes various contracts in CM's name for Owner, rather than having contracts directly with Owner; and/or CM directs work of labor crews directly employed by CM or Owner; and/or CM provides jobsite "shanties" or construction equipment.

CM SERVICE "D"

Same as CM Service "A," except that CM carries out some or all of the inspection of the work of the contractor(s) or "observation for compliance," on behalf of the Owner.

CM SERVICE "E"

Same as CM Service "A," except CM carries out predesign programming of requirements and/or coordinates predesign planning.

CM SERVICE "F"

Same as CM Service "A," except that CM has contractural obligation to the Owner for all required work to be included in the construction contract (or contracts, if there is more than one) within a predetermined project budget. Limit of CM's financial responsibility is CM's professional fee.

Source: Material in this table was provided courtesy of George T. Heery, FAIA, Atlanta, Georgia.

General contractors offering construction management services, however, are often willing to assume GMP risks. When the public owner wishes to employ this cost limiting approach, the initial agreement with the construction manager must note that a GMP amount will be established and agreed to. The actual amount is established only after design has progressed so that bids can be solicited and the construction manager can analyze all bids from construction contractors.

The third possible means to limit construction costs, Fixed Limit of Construction Cost, is preferred over GMP by design professionals offering construction management services. This approach implies that design will be modified as necessary to avoid exceeding a preset cost limit established by the owner. With Fixed Limit Construction Cost the construction manager acknowledges that unforeseen occurrences such as strikes or disasters can occur and will raise costs. The construction manager does not assume risk and responsibility for these unexpected problems. Instead, the construction manager may avoid exceeding the preset Fixed Limit Construction Cost by being able to make some cost saving design modifications. Design changes, however, do not necessarily imply changes to the owner's program.

There are many pros and cons to these cost limiting approaches. Table 8 provides a brief summary of these issues. Each of the cost limiting approaches has worked. However, none really guarantees project success. The subject of building project cost limitation must be addressed by legal counsel and high-level administration decision makers.

In-House Capabilities

The local administration should assess current staff capability in an objective fashion to determine needs for additional construction management services. Table 9 provides a listing of expertise typically required from a construction manager on a major project. If the administration finds that in-house capabilities are not sufficient it may choose to consider hiring additional staff based on projected long-range building plans. Most public agencies will not have sufficient long-term needs to justify hiring a construction management group and will choose instead to contract with an outside firm. Use of an outside firm may occur also for policy reasons as it does with use of outside design professionals.

If an outside construction management firm is commissioned, a certain amount of local administration staff time must be devoted to monitoring the

construction manager's efforts. Procedures should be determined in consultation with the construction manager to achieve this. Caution must be exercised in this regard so that the monitoring procedures do not consume inordinate amounts of time from the construction manager or the local administration, thus hindering work progress.

Dialogue with CM Firms

A public agency may take advantage of the willingness of several firms offering CM to describe their services. Professional societies and construction contractor organizations can provide referrals to nearby firms. In addition, Engineering News Record annually lists (by business volume) the top 400 construction contractors and the 500 largest design firms, noting which provide CM services. This listing, however, does not rate quality or include all firms providing construction management services.

Obtaining CM Services

Evaluation and selection of a construction management firm (or joint venture) is similar to selection of a project Architect/Engineer (A/E). In both cases professional services contracts are written. Selection is based primarily, if not completely, on capabilities and experience. Fees are determined based upon a detailed review of task requirements for the construction manager. Frequently fees are negotiated, not bid. Note that if a fee for construction management services is negotiated, construction work can still be publicly bid.

Two factors in construction manager evaluation and selection differ from A/E selection. First, the functions an owner may require of a construction manager are subject to more variation than is normal with A/E functions. Another aspect of this factor is that no two firms define construction management in quite the same way. Each has a special and characteristic approach. The second distinction from A/E selection procedures is the importance of clear delegation of responsibilities and the need for cooperation among the A/E, construction manager, public agency owner, and construction

Table 8

CONSTRUCTION COST LIMITING METHODS

MULTIPLE CONTRACT RESPONSIBILITIES	PRO:	Interests of construction manager and owner are linked since construction manager is not exposed to risk. CM fee stays low. Multiple contracts encourage small and minority businesses. Owner controls payments directly. Overruns and schedule problems handled through detailed cost control procedures.
	CON:	No single contractor assumes total cost responsibility by contract. Contractors may not perform as well for public agency as they would for a general contractor with whom they will have subsequent dealings. Final cost of project probably not fixed by contract until some construction has begun.
	ADVOCATES:	GSA/PBS, many private developers, many design professionals.
GUARANTEED MAXIMUM PRICE (GMP)	PRO:	Single contractor assumes full construction cost compliance by contract. Trades contractors will be working under a general contractor with whom they may work on other projects. Better control of sub-trades.
	CON:	Forces CM to act as entrepreneur - causes interest to diverge from owners'. The portion of CM fees to cover risk (2% or more) can be significant. Overruns not entirely prevented just because of a contract. Design professionals may have difficulties if they act as CM under GMP.
	ADVOCATES:	HEW, some contractors.

Table 8 - Continued

FIXED LIMIT COST	PRO:	CM promises the basic building at given cost by contract. Interests, however, of CM and owner are not divergent. CM not exposed to great risks; fees stay relatively low.
	CON:	Design and scope may be modified as the project progresses.
	ADVOCATES:	Design professions.

Table 9
CONSTRUCTION MANAGEMENT EXPERTISE AREAS

- Architecture
- Audit control
- Building management
- Civil engineering
- Computer technology
- Construction inspection and monitoring
- Construction management and control systems
- Construction supervision and/or inspection
- Contract law
- Electrical engineering
- Estimating (architectural, civil, mechanical, electrical)
- Job cost control
- Labor relations
- Mechanical engineering
- Project management
- Programming owner requirements
- Safety
- Structural engineering
- Supervision of various disciplines
- Traffic control management
- Urban design
- Value management studies

contractors. If the project design professional is selected first, then that firm should be party to construction manager work definition and possibly play an advisory role in selection. If the construction manager is selected first, the converse is true. In some cases project design professionals provide CM services for the project.

Selection of a capable, experienced construction manager and development of a workable contract are the two most important criteria for a successful project. Failure in these areas is the prime factor cited by jurisdictions with unsuccessful construction management experience.

There has been considerable controversy in past years concerning the capabilities of either general contractors, architects, or engineers to perform construction management services. Much of the controversy was among these three groups as competitors. Only recently have these groups officially agreed to work together to define CM and improve the general level of construction management services. Appendix C reproduces a policy statement on this subject that was jointly accepted by the American Consulting Engineers Council, the American Institute of Architects, and the Associated General Contractors of America.

Initial Project Notice

Local government requirements for advertising will generally apply to construction management services. All possible efforts should be made to assure that a large number of interested and qualified firms become aware of the jurisdiction's needs. A sample project notice used by GSA that the jurisdiction may adapt to its use is supplied in Appendix D.

Construction Manager Questionnaire

A local jurisdiction will want to learn all that it can about prospective construction management firms. The U. S. General Services Administration uses a standard questionnaire for this purpose that the local administration may wish to adapt (see Appendices E and F). Construction management firms should be willing to supply a list of past clients and detailed material describing the firm's experience and capabilities. Be sure to contact these references and also the design firms involved on the projects.

Evaluation and Selection

Local regulations may require that a group of prominent local citizens or elected officials are involved in the evaluation and selection process. Legal counsel should be consulted regarding questions on this subject. Procedures may require, for example, that a citizens' advisory group determine a number of candidate firms for final evaluation. The local jurisdiction may refer again to Table 9 for a list of technical expertise typically required of a construction manager.

In addition to technical capabilities construction management firms should be evaluated for experience, solvency, and current staff work load. Management plans should be requested from candidate firms and should be thoroughly evaluated. Be sure, for example, that the construction management firm will actually assign necessary experienced and capable staff to the project at hand. Table 10 suggests requirements that local administrations may wish to use as a starting point for evaluation. Final selection is normally made at an executive level based on successful discussion with one of the candidate firms.

The General Services Administration uses a two step procedure to accomplish construction manager selection. As firms or joint ventures submit qualifications statements, these submissions are evaluated competitively by an ad hoc committee of at least three professional employees of the Public Buildings Service. The offeror with the highest competitive score for qualifications together with all other offerors within a competitive range (normally no fewer than five of the top-rated firms) are invited to submit priced proposals, management plans, and resumes of key personnel.

Following the opening of proposals in the GSA procedure, discussions are held with each offeror. The offeror may choose to modify a submission if this is desired. Each of three factors (qualifications, management plan and price) is evaluated in the final selection process with slightly greater emphasis placed on the management plan.

Bear in mind that the evaluation and selection procedure used by GSA is one of several approaches that a public agency may use for screening potential offerors of construction management services. Locally applicable procedures must be followed. Price, for example, may or may not be an evaluation criterion. Whatever procedure the public agency employs, it is essential that a number of firms be considered to assure a wise selection.

Table 10

SUGGESTED REQUIREMENTS OF CONSTRUCTION MANAGER

The construction manager shall:

1. Be experienced in and competent to perform the type of services required by the government (refer to Table 6).

2. Shall have acted recently as a construction manager on more than one project of similar or larger size. Since the present-day notion of construction manager is relatively new, this requirement may be waived if in the judgement of the local jurisdiction there are sufficient qualifications to justify confidence.

3. Be financially solvent.

4. Have built, designed or managed construction in the general geographic area or have good knowledge of local conditions and laws (or have a joint venture partner with this experience).

5. Be able to provide a qualified project executive.

6. Have a good reputation and performance record in areas of cost control, value management, and schedule control.

7. Be in close geographic proximity to the project and project design design professionals.

8. Be able to provide a list of management and support personnel who will be involved with the project, and the extent to which they will actually be involved.

Contract Negotiation

Public agencies can use existing construction management contracts to assist legal counsel in developing a final contract. Candidate firms are often willing to supply copies of contracts that they recommend. The agency may also utilize aspects of contracts used by other jurisdictions or by Federal agencies. Finally, substantial efforts by societies of design professionals, associations of contractors, and GSA have produced a series of model contracts that the local government may wish to consider. These contracts are available (some at a nominal charge) as described in Appendix G.

Fee Basis

Estimates of the proper amount of the fee can be developed as described earlier, usually in the range between 2% to 4% of estimated construction costs. The contractual basis for specifying the proper amount, however, is just as important as the amount itself.

Several bases have been used by public jurisdictions to arrive at CM fees:

1. Percentage of construction cost (may be converted to a flat fee)
2. Fixed fee
3. Fixed fee, plus certain construction reimbursables (GSA approach)
4. Direct payroll expenses times a multiplier for overhead and profit
5. Fixed fee plus costs and overhead (with negotiated maximum fee limit)

Under the first basis, percentage of construction cost, the construction manager receives a larger fee for a more expensive project. This approach may discourage effective value management during design. The second basis, fixed fee, removes the incentive to look the other way on cost increases. The fixed fee basis, however, strains the construction manager's budget when unexpected problems occur that require substantial staff time to resolve. The temptation exists to put in less time than would be in the local administration's interest. The addition of certain reimbursable construction phase expenses reduces this problem. The last two methods are of a "cost-plus" nature and have not been frequently used. Use of a maximum fee limit that can be modified if unusual difficulties arise can prevent excessive fees with the cost-plus methods. It may be that costs and overhead entail a cumbersome audit procedure that should be considered prior to use of this fee setting approach.

USING CONSTRUCTION MANAGEMENT --- WHAT NEEDS TO BE DONE

According to the PTI survey, legal constraints and lack of awareness are major reasons why construction management is not more frequently used by local and state governments. Of the 169 replies received, 96% of state and county officials and 91% of school building officials were familiar with construction management and the use of a construction manager. Among city officials, however, only 58% were familar with the concept. Of those public building authorities familiar with construction management, 32% have utilized construction management in their jurisdiction's building program. Of those jurisdictions that have not used construction management, 30% indicated restrictive laws and regulations as the reason for no use with public buildings. Restrictive laws or rules were cited by 39% of the school construction authorities. Two-thirds of public building authorities in cities with populations between 500,000 and one million noted that legal restrictions deterred CM use.

Specifically, those laws and rules that hinder or are interpreted to restrict the use of construction management techniques are concerned with three issues. First, the view that a construction manager is the same as the general contractor in the traditional sense, but working under a negotiated contract, would circumvent public competitive bidding procedures. Second, in the lump sum method, several government jurisdictions require the design phase to be complete prior to bidding and cannot separate contracts for construction disciplines. Finally, construction management, still a new concept, often has not been recognized as a distinct professional activity.

In certain states (e.g., Arkansas, New York) controversy exists concerning the legal acceptability of either design professionals or contractors to practice construction management. The Arkansas law for licensing contractors, for example, has been interpreted to state that only licensed contractors can practice CM. The New York State law for registration of architects, in contrast, clearly states that architects can practice construction management.

At the 1975 Annual Meeting of the National Association of State Contractor Licensing Agencies, representatives of the Joint Conference on Construction Management of the Associated General Contractors of America

(AGCA), American Institute of Architects (AIA), and American Consulting Engineers Council (ACEC) were invited to lead an examination of CM licensing for NASCLA members. The AGCA, AIA, and ACEC all opposed limiting CM practice to either the design professions or contractors and recommended against attempts to license CMs. A paper on the subject was prepared and presented at that meeting and is available.[5]

Clarification and amendments to laws and rules have been made in several instances. According to the PTI survey, 15% of those jurisdictions using construction management changed existing laws to make its use possible. One of the most impressive users of construction management that required exception to existing laws is the $135 million University of Massachusetts campus in Boston.

Many public agencies not using CM are content with their current building procedures. Jurisdictions without major complex projects do not need the technique. Other large public development agencies have sophisticated in-house technical staff to perform certain CM functions. Use of in-house staff was particularly noticeable among school construction authorities that have experienced extensive construction programs through the past decade.

Construction management projects are not always considered successful by public owners. PTI's survey of local and state government use of the technique indicated three areas of concern. There are special needs for:

- Selection of an experienced and capable construction manager who can work effectively with the owner, design professionals and contractors.
- Application of CM arrangements only to large and complex projects where the benefit of project coordination and competitive bidding for multiple contracts can be realized.
- Development of contracts linking the members of the building team which clearly and unambiguously place proper responsibilities on each member.

Many new firms are trying to enter the market for construction management services. Lack of experience can hurt their first few clients. Most established construction management firms have developed from existing

---

5 "Construction Management Licensing Analysis", Prepared by George T. Heery, October 24, 1975.

architectural, engineering, or general contracting firms. As a result they have individual strengths and weaknesses based on their previous experience. When contracts are developed, there is a real problem in assuring that the right firm is being placed under the right contract, clearly understanding the owner's intent.

Finally, success stories about the construction management approach unfortunately have encouraged some to apply the approach to relatively simple and inexpensive projects where potential benefits are minor. The absence of good guidelines based on experience for using construction management made this mistake more likely.

These exceptions have been noted, and the evidence is clear that construction management has much to offer jurisdictions and public agencies faced with the need to create major and complex facilities within the confines of budgets and bond issues. Cost overruns and the headaches they bring the public official can be controlled when the planning and control function is introduced into the project at the beginning-as is the case with construction management. It is the purpose of this publication to make that possible for urban officials and agency administrators everywhere.

APPENDICES

Appendix A
SOURCES FOR FURTHER INFORMATION

Construction Contracting. Clough, Richard Hudson. New York, John Wiley and Sons, 3rd Edition 1975.

Construction Management (S213) (Tape Cassette). The American Institute of Architects, Publication Sales Department, 1735 New York Avenue, N.W., Washington, D.C. 20006, $12.50.

Construction Management. Atkinson, Ian Edward. New York, American Elsevier.

Construction Management. Douglas, Clarence J., and J. Munger Elmer. Englewood Cliffs, New Jersey, Prentice Hall, Inc., 1970.

CM for the General Contractor: A Guide Manual for Construction Management. The Associated General Contractors of America, 1957 E Street, N.W., Washington, D.C. 20006, $19.95

"Construction Management Guidelines" (10 pages). The Associated General Contractors of America, 1957 E Street, N.W., Washington, D.C. 20006, $0.25.

Construction Management Practice. Volpe, Sonnino Peter. New York, Wiley-Interscience, 1972.

The Construction Manager. Royer, Kine. Englewood Cliffs, New Jersey, Prentice-Hall, 1974.

Construction Scheduling and Control. Deatherage, George E., New York, McGraw-Hill Book Co., 1965,

Control and Management of Capital Projects. Hackney, John W. New York, John Wiley and Sons, 1965.

CPM in Construction Management. O'Brien, J.J. New York, McGraw-Hill Book Co., 1971.

The GSA System for Construction Management. U.S. General Services Administration, Public Buildings Service. (See Appendix B for availability)

Guide for Project Applicants; Construction Management Services, Technical Handbook for Facilities Engineering and Construction Manual - 2.4. June, 1975, Available without charge from HEW regional offices or: Director, Office of Federally Assisted Construction, OFEPM, Department of Health, Education and Welfare, 330 Independence Avenue, S. W., Washington, D. C. 20201.

Handbook of Construction Management and Organization. Bonny, John Bruce, and Joseph Frein. New York, Van Nostrand Reinhold, 1973.

"Owners Guide: Building Construction Contracting Methods" (11 pages). The Associated General Contractors of America, 1957 E Street, N. W., Washington, D. C. 20006, $0.25.

Principles of Construction Management for Engineers and Managers. Pilcher, Roy. New York, McGraw-Hill, 1966.

Professional Construction Management and Project Administration. Foxhall, William B. New York, Architectural Record and the American Institute of Architects, 1972. $12.50.

Project Management for Construction Superintendents. Begley, Francis D. Toronto, Saunders of Toronto, Ltd., 1970.

"Something Better Than Turnkey," Seminar Proceedings, March 7, 1974. American Consulting Engineers Council, 1165 15th Street, N. W., Washington, D. C. 20005.

Systems Analysis and Project Management. Cleland, D. I., and W. R. King. New York, McGraw-Hill Book Co., 1968.

Time, Cost and Architecture. Heery, George T. New York, McGraw-Hill Book Co., 1975.

Appendix B
GSA POLICY ON CONSTRUCTION MANAGEMENT

The U.S. General Services Administration, Public Buildings Service, has been a major advocate of the construction management approach since 1970. GSA policy is outlined in a document entitled The GSA System for Construction Management, available as described below. Local jurisdictions may find in the GSA publication much valuable information including procedures, means to evaluate construction management firms, and the standard GSA contract.

The quotation that follows is reproduced from the document.

CONSTRUCTION MANAGEMENT CONSIDERATIONS

General Observations

Funds for both design and construction must be fully available by the completion of Tentatives (30% design stage). The Public Buildings Amendment of 1972 has provided GSA with a revolving Federal Building Fund which provides, when needed, such funds from user charges paid by occupying agencies. Authorization of projects by the Congress still remains a requirement.

Financial Involvement. One of the major controversies on construction management revolves around the extent of financial risk a Construction Manager should have in the actual construction cost of the building. GSA wants an uninhibited Construction Manager. It is GSA's belief that freeing him of major construction cost risks, serves the Government's best interest by optimizing the value of his input on the NEW TEAM, since he can now afford to give frank and objective advice, independent of any personal considerations of financial gair or loss in the outcome. Therefore, GSA is in opposition to the employment of a Guaranteed Maximum Price in its contracts with Construction Managers. GSA fully expects that the CM will utilize his expertise to see that the project is completed within the predetermined time and cost limitations.

CM Fee Comparisons. Don't be mislead. What may be reinbursable in GSA's contract (like the reinbursable jobsite staff) may be in the basic fee of some other organization. Careful review of the CM contract requirements for the specific projects being compared is necessary in all cases.

Prerequisites. The selection of the site and development of a detailed program for building is a necessary preliminary to the CM/phased construction process.

Decisions. Fundamental to phased construction is early commitment. Decisions tend to be irrevocable.

Design Involvement. A major difference between a CM and a normal general contractor is the CM's extensive participation in the design development of a project.

Combination. Phased construction generally should be used only in conjunction with a building team including the Architect-Engineer and the Construction Manager.

Scheduling. The shorter lead times inherent in phased construction make project scheduling critical.

Risks. GSA, by directly contracting for phased construction, assumes greater risks and responsibility for the successful outcome of the project.

Contractual Authority. Although the Government cannot delegate contractual authority to private firms (this includes the CM), it is dependent on the expertise of the CM in making judgments as to how the work should be contracted.

Assisting in Procurement. CMs must be experienced in Government procurement and anticipate the amount of work required in assisting the Government with these services.

Bidding. CMs are generally prohibited from bidding themselves on the separate construction packages to avoid any conflict of interest.

Open End Costs. Since the total cost of construction will not be fully determined until the last separate bid package is awarded, certain determinations and adjustments in the project, and give and take to balance requirements to costs and fund availability, will of necessity take place progressively as each separate bid package is awarded, in order that the project stays within predetermined budgetary limits.

Equipment Ordering becomes critical at the start of a project. Example: switchgear procurement is not so urgent in the sequential process, when the construction start may be many months after the design start. With phased construction, work at the jobsite may be underway a few weeks after the design contract award.

Value Management, exploited in both the design and construction phases of the project contracts, is generating appreciable savings while maintaining the requisite quality and esthetic freedom. VM savings are shared with construction contractors but not with the A-E or the CM.

Inspection. The CM is responsible for the inspection of the work of the separate construction contractors at the jobsite. Since GSA supports the use of registered professionals for these services, the CM is encouraged to employ personnel of the design A-E to supplement his inspection staff.

Labor. To realize the full potential of the construction industry, labor must be fully and creatively involved.

Changes are generally prohibitive in cost if made after construction starts on a related bid package.

Favorable Aspects

GSA's Experience in the Owner's Role. For the first time, we are closely involved in the actual day to day process of scheduling, managing and controlling our building projects from start to finish, determining what is happening and what will happen.

Control. Continuous close control of quality, money, time, personnel, and contracts is maintained. GSA has placed increased emphasis on CMs reporting in advance potential cost overruns accompanied by the CMs corrective recommendations for design adjustments.

Information Base. The construction management system provides the Owner assurance of receiving a factual input for decision making that is truly multi-disciplined in outlook.

Specialization. Construction management permits each member of the project team - Owner, A-E, and CM - to concentrate on those disciplines in which his expertise is greatest.

A-E Involvement. Not since the days of the master builders have architects been more intimately involved in projects, from concepts through the major time-span of the design-construction overlap.

Innovation. Design and construction is more flexible and open to innovation.

Competition. Better bidding and more competition on the many separate construction contracts since the financial resources required are less and the time-span from bidding to installation shortened.

Bid Shopping has been reduced.

Response. Separate contractors (ex-subcontractors) are more visible and responsive to the Government.

Payment. The better organized and more management conscious contractors are rewarded by direct and early payment. The 10% retainage until final completion has been deleted from both the construction contracts and the CM contract.

Corner Cutting. With the CM free of construction costs risks, the temptation to cut corners and leave something out or install something inferior is eliminated. His previous experience in contracting will alert him to similar attempts by those contractors that he now directs and controls.

Marginal Construction Managers can be terminated easier than general contractors.

CMCS. Computer based systems of this type provide the essential tool required for continual scrutiny of quality-time-cost tradeoffs during planning, design, and construction.

Time. With phased construction, savings of up to two years in design-construct time are possible.

Cost Reductions. Significant reductions in first costs, operating, and life cycle costs result. GSA has developed and employs a Life Cycle Management Model which pinpoints all these costs for its projects.

Energy Contingencies. The shorter bid to delivery period under CM and the payment for advance procurement of materials now permitted by

Energy Contingencies. (Cont'd) GSA have acted to counter the high contingencies being placed on energy intensive building materials by apprehensive bidders.

GSA's Commitment. As of April 1, 1975, GSA has commited to this approach construction projects totaling $530 million in cost and will continue to use this system for all projects over $5 million in the future.

In Summary. We now don't wait until the end of the construction game to add up the score to see what won or lost - schedule? cost? or quality? Instead, we now have a system which permits us to monitor and adjust continuously and stay within project objectives.

Problem Areas

Full Time Services during design of a Construction Executive or Construction Superintendent on small projects is usually unwarranted.

A-Es as CMs. Interested A-Es should have a capability to manage, direct coordinate, and expedite the day to day field operations of many separate construction contractors, if they seek GSA construction management contracts.

Buying-In, at or below cost, by firms or joint ventures which want to get a foothold in the expanding field of construction management is detrimental to overall service.

Meaningful Involvement of CMs in design development has been difficult to achieve. For many CMs, this is a new responsibility for which they must develop the necessary experience and expertise.

CM Estimates need to acquire more reliability.

Conceptual Estimating where design approaches are comparatively explored and evaluated is an area in which CMs should develop more expertise.

Bypassing CMs. CMs must be recognized on the jobsite as the principal authority over the separate construction contractors.

Sophistication. Separate construction contractors must adapt to more complex management methods.

Delay by one separate contractor may domino into delay by many separate contractors.

Leverage. Normal general contractors have more leverage on subcontractors (i. e. future association on other projects) than the Government has on separate construction contractors. However, by contracting directly with the Government the separate contractor is assured of fair treatment and prompt payment.

Value Management. Many claim to do it but do they have workshop trained people? Look out for CM bid shopping for low cost value specialist consultants. Make sure the CM allocates time for it and schedules it.

Single copies of The GSA System for Construction Management (April 1975) may be obtained free-of-charge from:

Assistant Commissioner for Construction Management (PC), Public Buildings Service, GSA, 18th and F Streets N.W., Washington, D.C. 20405, or

Director, Construction Management Division, of the appropriate GSA regional office below.

REGIONAL OFFICES

General Services Administration Post Office and Courhouse Boston, Massachusetts 02109 (617-223-2100)	Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont
General Services Administration 26 Federal Plaza New York, New York 10007 (212-264-3311)	New Jersey, New York Puerto Rico, and Virgin Islands
General Services Administration Room 4341, GSA Building 19th and F Streets N.W. Washington, D.C. 20405 (202-343-6431)	Delaware, District of Columbia Maryland, Pennsylvania, Virginia, and West Virginia

General Services Administration 1776 Peachtree Street, N. W. Atlanta, Georgia 30309 (404-526-0111)	Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee
General Services Administration Everett McKinley Dirksen Building 219 South Dearborn Street Chicago, Illinois 60604 (312-353-4400)	Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin
General Services Administration Federal Building 1500 East Bannister Road Kansas City, Missouri 64131 (816-361-0860)	Iowa, Kansas, Missouri, and Nebraska
General Services Administration 819 Taylor Street Fort Worth, Texas 76102 (817-334-3011)	Arkansas, Louisiana, New Mexico, Oklahoma, and Texas
General Services Administration Building 41 Denver Federal Center Denver, Colorado 80225 (303-233-3611)	Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming
General Services Administration 525 Market Street San Francisco, California 94105 (415-556-3252)	Arizona, California, Hawaii, and Nevada
General Services Administration Regional Headquarters Building Auburn, Washington 98002 (206-833-5233)	Alaska, Idaho, Oregon, and Washington

For More Information on GSA Methods

Write the Assistant Commissioner for Construction Management (PC) at the above address (Area Code 202 - 343-4731)

Appendix C
THE AGC/AIA/ACEC POSITION

On August 15, 1975 the individual National CM Committees of the Associated General Contractors of America, the American Institute of Architects, and the American Consulting Engineers Council met together in Denver as a joint national CM Council.

At that meeting, a general statement and position paper was unanimously adopted by the joint council, including representatives of all three organizations.

Subsequently, that statement has been ratified by the Boards of Directors of the AIA, the AGC, and the ACEC.

A copy of that statement/position paper is reproduced below.

Observation of the proceedings of the Denver meeting indicated substantial concurrence by representatives of all three CM Committees that registration of CMs at this time was probably not feasible nor desirable.

A STATEMENT OF THE JOINT CONFERENCE OF THE AGC CONSTRUCTION MANAGEMENT COMMITTEE, THE AIA CONSTRUCTION MANAGEMENT COMMITTEE, AND THE ACEC CONSTRUCTION MANAGEMENT COMMITTEE

Denver, Colorado
August 15, 1975

The Construction Management Committees of the AIA, AGC, and ACEC, in joint conference, recognize the importance of the Construction Management process and have agreed to work together collectively on a National Comprehensive Construction Management Program to implement the following:

1) To define, develop, and disseminate the standards and levels of quality of Construction Management;

2) To develop guide lines and educational programs for the assistance of Members and Owners engaged in Construction Management;

3) To relate and coordinate with all elements in the industry performing Construction Management services, to develop acceptable industry-wide standards for Construction Management;

4) To monitor and to make joint recommendations with respect to legislation and regulations at the federal, state, and local levels affecting Construction Management; and

5) To communicate and maintain liaison with the Owners and Users of Construction Management services, advising and assisting them on the best and most economical procedures.

The following statement is made with respect to Construction Management services provided to the Owner or the User/Client, being referred to hereinafter as CM.

Construction Management requires a number of skills relating to the knowledge of construction process, and knowledge of the design process, and the fundamentals of general and project management.

A background in construction contracting, architecture, and engineering can all provide a basis of experience for entering the field on Construction Management. However, the basic minimum capabilities of contractors, architects, and engineers do not necessarily and automatically provide an individual with all of the skills required of a competent CM.

From a practical standpoint, an effective CM organization is likely to be a multi-discipline organization. However, CM is an appropriate function for construction contractors, as well as architectural or engineering firms or divisions thereof, so long as said organization or division, in fact, has CM capabilities.

It is the view of this group that neither architects, engineers, nor contractors should take any action in connection with the liscensing or other laws which would have the effect of reserving to themselves Construction Management markets.

Appendix D

SAMPLE PROJECT NOTICE

CONSTRUCTION MANAGEMENT SERVICES

The (insert jurisdiction name) construction management services for the proposed (insert building name and location) to provide approximately (insert) gross square feet within an estimated cost range between $(insert) and $(insert) million. Design and construction will be concurrently phased with separate construction contracts awarded as segments of the design are completed by the architect-engineer.

Consideration will be given to firms or joint ventures generally meeting the following requirements:

1. Experience as a Construction Manager or potential competence to perform construction management services; 2. Financial ability to provide the services required by the Government; 3. Competence in civil, mechanical, electrical and structural engineering, value management; construction estimating, cost accounting and control; tenant coordination; project management; contract negotiation and administration; construction superintendence and inspection; and other related fields; 4. Experience in constructing buildings in the general geographic area of this project, or good recent knowledge of local conditions in the project area, or ability to retain others with such knowledge; 5. Proven competence in the implementation and maintenance of network-based construction management systems and in the application of systematic cost control throughout the design and construction process; 6. Good professional and business reputation, and an on-time and within budget performance record; and 7. Ability to provide professionally qualified key personnel with a minimum of 12 years satisfactory experience in the design and construction industry. Satisfactory experience should include:

a. Eight years in work related specifically to the duties to be performed in the designated position for this project; and

b. Four years in positions with requirements equal to those for the designated position of this project.

Prospective construction management firms or joint ventures who are interested in the project are invited to ask for Request for Qualifications Submission which will be issued by the office below on or by (insert date). Qualifications will be received until (insert date) at the office below, and then evaluated on the basis of the requirements and criteria contained in the Request for Qualifications Submission. Request for Priced Proposal will be subsequently issued to only those firms or joint ventures whose Qualifications have been determined by (insert) as being within a competitive range. Only Priced Proposals specifically requested by the Government will be considered.

Appendix E

SAMPLE REQUEST FOR QUALIFICATIONS SUBMISSION

Gentlemen:

SUBJECT: Request for Qualifications Submission
Construction Management Contract No. _____

_____
(Project name, location, and number)

The Public Buildings Service of the General Services Administration requires the services of a Construction Manager in connection with the project identified above. A copy of the contract which will be awarded is enclosed.

You are invited to submit background data with respect to your qualifications for performing services of the nature that will be required under this contract. Please submit information, responsive to the questions set out in the enclosed questionnaire, in the same order as the questions. Responses should be specific and precise, with as much detail as will accurately disclose your capabilities for performing the services to be required of the successful offeror. You may submit any additional information or data, not called for by the questionnaire, which you believe would be pertinent to the evaluation of your qualifications for performing this contract.

Your response to the questionnaire must be submitted in triplicate to the Project Manager, _____

_____

no later than _____ local time at the foregoing location, on _____ 197__. No submissions received after that time will be considered, except under the conditions set out in the enclosed "Late Proposals, Modifications of Proposals and Withdrawals of Proposals."

The information and data submitted by offerors, as well as that obtained by independent inquiries, will be evaluated competitively.

The offeror having the highest evaluated score, together with all other offerors within a competitive range, will be invited to submit priced proposals. Prior to the preparation of their priced proposals, they will be given an opportunity to attend an orientation meeting at which they will be briefed on contract requirements and be given time to ask any questions. The priced proposals will consist of a lump sum amount for performing the contract (inclusive of profit and all costs, direct and indirect, including overhead, but

exclusive of costs that are reimbursable under the terms of the contract), a management plan for performing the services, including a staff listing of nonreimbursable personnel who will be utilized in performance of the contract, and a tentative listing of reimbursable job-site staff by categories and numbers of personnel.

If you have any questions with respect to the questionnaire, please submit them in writing in time to reach the Project Manager at least five days in advance of the date specified for submission of the completed questionnaire.

Sincerely,

Project Manager

Enclosures

a. Construction Manager Questionnaire
b. Copy of proposed contract
c. "Late Proposals, Modifications of Proposals, and Withdrawals of Proposals"

LATE PROPOSALS, MODIFICATIONS OF PROPOSALS,
AND WITHDRAWALS OF PROPOSALS

(a) Any proposal received at the office designated in the solicitation after the exact time specified for receipt will not be considered unless it is received before award is made, and:

(1) It was sent by registered or certified mail not later than the fifth calendar day prior to the date specified for receipt of offers (e.g., an offer submitted in response to a solicitation requiring receipt of offers by the 20th day of the month must have been mailed by the 15th or earlier);

(2) It was sent by mail (or telegram if authorized) and it is determined by the Government that the late receipt was due solely to mishandling by the Government after receipt at the Government installation;

(3) It is the only proposal received; or

(4) It offers significant cost or technical advantages to the Government, and it is received before a determination of the competitive range has been made.

(b) Any modification of a proposal is subject to the same conditions as in (a) of this provision.

(c) The only acceptable evidence to establish:

(1) The date of mailing of a late proposal or modification sent either by registered mail or certified mail is the U.S. Postal Service postmark on the wrapper or on the original receipt from the U.S. Postal Service. If neither postmark shows a legible date, the proposal or modification of proposal shall be deemed to have been mailed late. (The term "postmark" means a printed, stamped, or otherwise placed impression that is readily identifiable without further action as having been supplied and affixed on the date of mailing by employees of the U.S. Postal Service).

(2) The time of receipt at the Government installation is the time-date stamp of such installation on the proposal wrapper or other documentary evidence of receipt maintained by the installation.

(d) Notwithstanding (a) and (b) of this provision, a late modification of an otherwise successful proposal which makes its terms more favorable to the Government will be considered at any time it is received and may be accepted.

(e) Proposals may be withdrawn by written or telegraphic notice received at any time prior to award. Proposals may be withdrawn in person by an offeror or his authorized representative, provided his identity is made known and he signs a receipt for the proposal prior to award.

Appendix F

CONSTRUCTION MANAGER QUESTIONNAIRE

GENERAL SERVICES ADMINISTRATION
PUBLIC BUILDINGS SERVICE

_____

(Project name, location, and number)

FIRM DATA

1. PRESENT ORGANIZATION
If offeror is a joint venture, supply requested information in each involved firm.

a. Firm.
(1) Name, address, telephone, person to contact?
(2) Name of parent company (if any)?

b. Types of Services
(1) Construction management?
(2) Project management?
(3) General construction contracting, with building types?
(4) Specialty construction contracting?
(5) Design-build?
(6) Architect-Engineer?
(7) Combination, explain?
(8) Other, explain?

c. Legal Form.
(1) Individual, partnership, corporation, joint venture, or other?
(2) Date and location of establishment or incorporation under present name?
(3) Former names, locations, and dates (if any)?
(4) Names, titles, and addresses of firm owner, partners, or officers?
(5) States and categories in which firm is legally qualified to do business?

d. Branch offices.
For each branch give:
(1) City, state, and telephone number?
(2) Number and type of personnel?
(3) Person in charge?
(4) Capability of performing independently of main office?

e. Operational Areas.
List geographic areas of the United States in which firm conducts business and value of construction work put-in-place during the past five years in each area?

f. Size.
(1) Present number and type of employees in home office, and in field offices (construction sites)?
(2) Number and type of employees during each of the past five years?
(3) Average annual receipts for the preceding three fiscal years?

g. Facilities.
(1) Office space, equipment, and computers?
(2) Field facilities and equipment?

2. PERSONNEL
a. General.
(1) Policies?
(2) Recruitment, orientation, training, and development?
(3) Employee benefits and privileges?
(4) Employee relations?
(5) Employee average length of service?

b. Employee Qualifications.
Describe design oriented capabilities of personnel of your firm or joint venture, or consultants in the following areas:
(1) Job Cost Control,
(2) Architechtural Engineering,
(3) Civil Engineering,
(4) Construction Superintendence,
(5) Contract Law,
(6) Electrical Engineering,
(7) Estimating (architectural, civil, mechanical, electrical),
(8) Construction Inspection,
(9) Labor Relations,

b. Employee Qualifications. (Cont'd)

(10) Mechanical Engineering,
(11) Safety,
(12) Structural Engineering,
(13) Testing Facilities,
(14) Value Management,
(15) Management,
(16) Construction Management Control Systems,
(17) Computer Technology, and
(18) Other.

c. Competence.

In what technical disciplines do you consider your staff to be exceptionally strong? Why? What are the names and specialties of the particular experts?

d. Design Contact.

Have your key employees been in personal contact with the designers or your construction projects during the design development? Extent and depth of the contacts?

e. Continuity.

(1) What is your capability to sustain loss of key personnel without adverse effect on a project or the firm?
(2) How do you minimize personnel shifts in projects?
(3) Recent history of key personnel turnover with dates, names of personnel and projects, and causes for changes.

3. CONSTRUCTION MANAGEMENT

a. Organization.

(1) Team, departmental, combination, permanent, temporary?
(2) Leadership and decision making?
(3) Top management involvement?
(4) Personnel recruitment, within firm or from outside?
(5) Number of personnel normally assigned to project during design, during construction, relationship to construction cost?

b. Planning.

(1) Initial
(2) Followup

c. Design Related Operations.

(1) Extent?
(2) Personnel involvement?
(3) Working procedures, coordination, followup, and cooperation with Contractors, A-E, and Owner?
(4) Inputting construction know-how?
(5) Market analysis?
(6) Interfacing construction contracts?
(7) Bid packaging and solicitation?
(8) Long range procurement?

d. Construction Related Operations.

(1) Extent?
(2) Personnel involvement, full, part time?
(3) Working procedures, coordination, follow-up, checking, and cooperation with Contractors, A-E, and Owner?
(4) Superintendence?
(5) Inspection?
(6) Technical support and consultants?
(7) Administration?
(8) Handling change orders, shop drawings, materials approvals, samples, as built drawings, and claims?
(9) Labor relations?
(10) Construction facilities, equipment, materials, and manpower?

e. Overlap of Design and Construction.

Describe your experience in managing phased construction activities, with particular emphasis on its special problems and their resolution.

f. Responsibility and Liability.

Discuss your review of the extent of your responsibility and liability as a Construction Manager under the proposed GSA contract.

g. Associations.

With respect to joint ventures or associations with other firms, please describe in detail previous associations on construction projects in sufficient detail to demonstrate your ability to effectively work with and manage a combination of firms. Indicate who the firms were if they are different from the ones proposed for this project.

h. Improvements.
What changes have been instituted in the last 5 years to improve your operations? Why were they needed? Have they been successful?

4. CONSTRUCTION MANAGEMENT CONTROL SYSTEM
Describe your firm's competence in the implementation and maintenance of network-based construction management control systems and in the application of systematic cost control methods. Give answers to the following:

a. Do you use computer generated schedules for construction management?
b. Do you require separate contractors to prepare their own schedules? Explain.
c. What is your experience in scheduling A-E activities?
d. What is your method of estimating construction requirements in pre-construction planning?
e. To what level-of-detail should a construction schedule be defined?
f. Which method of diagramming schedules do you normally employ, activity-on-arrow or precedence diagramming method? Explain.
g. Do you use cost-on-activities as a basis for control and/or payment?
h. To what extend do you rely upon the capabilities of your sub-contractors to provide estimating know how?
i. Do you employ computer accounting systems in your work?
j. How do you use your computer systems to forecast work-in-place, manpower requirements, productivity, cash flow, and budget overruns?
k. What relationships do your narrative reporting systems have to your automated systems?
l. Have you ever employed GSA's construction management control system? Where? How? Results?

5. INNOVATION
Discuss your familiarity, involvement, and application of any of the following techniques or systems:

a. Project Management,
b. Conceptual Estimating,
c. Life Cycle Costing,
d. Specifications System,
e. Building Systems and
f. Value Management.

6. WORKLOAD

a. Present Projects. List (giving names of projects, locations, owners, estimated construction costs) work your firm responsible for, percent of design completion and construction completion, and firms associated with (if any).

b. Capacity. Describe in today's construction dollar the volume of work which your firm can handle at this time with a) your present force and b) with readily available augmentation (i.e. give number and types of additional personnel required).

c. Long Term Record. List in today's construction dollars, the volume of work your firm has handled for each of the past 5 years. Discuss reasons for any major fluctuations.

7. LOCAL KNOWLEDGE

Show recent knowledge and experience with local construction conditions in the proposed GSA project area.

8. PROCEDURES, CRITERIA, AND REGULATIONS

Discuss your familiarity with GSA's requirements based on your past experience.

9. SOCIO-ECONOMIC

Describe your experience with:

a. Energy Conservation,
b. Environmental Control,
c. Equal Employment Opportunity,
d. Small Business Utilization,
e. Utilization of Minority Businesses,
f. Employment of the Handicapped and
g. Other?

10. FINANCIAL STATEMENT

Attach statement of financial condition including regular dated statement or balance sheet.

11. REPUTATION

Give name, address, telephone number, and person to contact for any of the following references you wish the Government to contact concerning your firms ability:

a. Owners,
b. Bonding Companies,
c. Financial Institutions,

d. Public Officials,
e. Architect-Engineers,
f. General Contractors,
g. Major Subcontractors, and
h. Major Suppliers.

PROJECT DATA

General Note. Base your written answers to the following searching questions on the actual experience of your firm or joint venture during the last five years. The replies should be detailed and informative, and cover all the facets of the questions.

12. PROJECT EXPERIENCE - GENERAL.
Describe your experience on completed construction projects giving the following information on each project reported:
a. Project name and location;
b. Project description;
c. Construction cost;
d. Design start and completion dates;
e. Construction start and completion dates;
f. Actual work you performed;
g. Owner's name, address, telephone number, and person to contact; and
h. Architect-Engineer's name, address, telephone number, and person to contact.

13. PROJECT EXPERIENCE - SPECIFIC
For one or more of the above completed construction projects (maximum) of three) which you consider similar to or equivalent to the proposed GSA project, provide the following additional information:
a. Discuss any original or unique thinking or judgement exercised by your staff during the design development or construction;
b. Number and subject of addendum issued during bidding; why they were needed;
c. Number and subject of change orders issued during construction; why they were needed; and how they effected the construction progress;
d. The total construction award amount compared to the final prebid estimate;

e. Completed construction cost compared to the initial construction award amount and to the construction estimate when design was initiated;

f. The initial schedule in months for design and for construction compared to the actual time spent;

g. Extent of your involvement in project problems during both design and construction including any design or construction omissions, errors, other deficiencies, or changed conditions;

h. Discuss your relationships with the owner; the architect-engineer and the construction contractors (prime or sub);

i. Describe any post-construction problems in start-up, operation, or maintenance;

j. If you were doing the project again, would you do anything different? Why?

14. SIMILARITIES AND DIFFERENCES

In what way were your duties and services on the foregoing projects similar or equivalent to the services required in GSA's construction management contract? How were they different?

Appendix G
SAMPLE CONSTRUCTION MANAGEMENT CONTRACTS

"Standard Form of Agreement Between Owner and Construction Manager," Document Number 8, January, 1974. Available from The Associated General Contractors of America, 1957 E Street N.W., Washington, D. C. $0.50.

A101/CM "Owner-Contractor Agreement, Stipulated Sum, Construction Management Edition," May, 1975, The American Institute of Architects, 1735 New York Avenue, N.W., Washington, D.C. 20006. (Available for $0.35 from AIA Publications Sales Department).

A201/CM "General Conditions of the Contract for Construction, Construction Management Edition," January, 1975. The American Institute of Architects, 1735 New York Avenue N.W., Washington, D. C. 20006. (Available for $1.00 from AIA Publications Sales Department).

B141/CM "Owner-Architect Agreement, Construction Management Edition," April, 1975. The American Institute of Architects, 1735 New York Avenue N.W., Washington, D.C. 20006. (Available for $0.35 from AIA Publications Sales Department).

B801 "Owner-Construction Manager Agreement," December, 1973. The American Institute of Architects, 1735 New York Avenue N.W., Washington, D.C. 20006. (Available for $0.35 from AIA Publications Sales Department).

Construction-Management Contract Information Sheets (for AIA documents listed above) free. Write the American Institute of Architects, Director of Professional Practice, 1735 New York Avenue N.W., Washington, D.C. 20006.

U.S. General Services Administration -(See The GSA System for Construction Management in Appendix B).

FURTHER INFORMATION

Public agencies desiring further information or assistance regarding construction management may contact:

Public Technology, Inc.
Building Technology Program
1140 Connecticut Ave., N.W.
Washington, D.C. 20036